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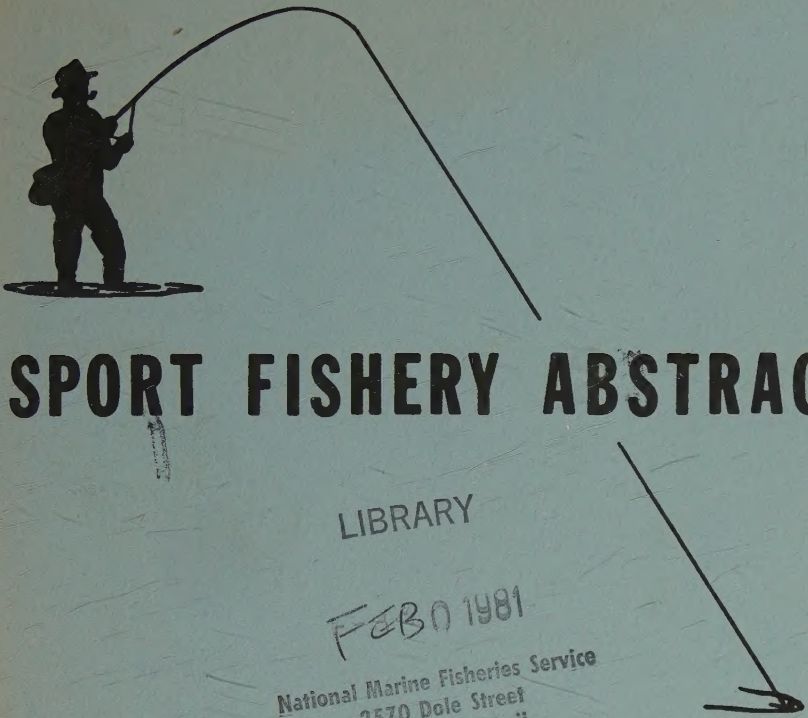

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SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 25 Number 4 1980

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GENERAL FISH CULTURE

80-002463 Jeffries, E. R. PROCEEDINGS OF THE THIRTHIETH ANNUAL NORTHWEST FISH CULTURE CONFERENCE. *Proc. Annu. Northwest Fish Cult. Conf.* 30:1-154. Dec. 1979 (1980). SFA 25(4)

A collection of unedited briefs or oral reports presented at the conference.

80-002464 Kutty, M. N. AQUACULTURE IN SOUTH EAST ASIA: SOME POINTS OF EMPHASIS. *Aquaculture* 20(3):159-168. July 1980. SFA 25(4)

[Fish. Coll., Tamil Nadu Agric. Univ., Tuticorin-628003, India]

TROUT AND SALMON CULTURE

80-002465 Fagerlund, U. H. M.; D. A. Higgs; J. R. McBride; M. D. Plotnikoff and B. S. Dosanjh. THE POTENTIAL FOR USING THE ANABOLIC HORMONES 17α-METHYLTESTOSTERONE AND (OR) 3,5,3'-TRIIODO-*L*-THYRONINE IN THE FRESH WATER REARING OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) AND THE EFFECTS ON SUBSEQUENT SEAWATER PERFORMANCE. *Can. J. Zool.* 58(8):1424-1432. Aug. 1980. In English with French summ. SFA 25(4)

[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada] Juvenile coho salmon (*Oncorhynchus kisutch*) held in 11°C fresh water (FW) were fed Oregon moist pellets supplemented with 3,5,3'-triiodo-*L*-thyronine at 4 ppm (T_3^4) or 20 ppm (T_3^{20}) and (or) 17α-methyltestosterone at 0.2 ppm ($MT^{0.2}$) or 1 ppm (MT^1) until early or normal seawater (SW) transfer. During FW residency all hormonal treatments improved growth, appetite, and food utilization. In February, fish fed T_3^{20} singly or with MT had increased degranulation of somatotrop cytoplasm. Thyroid epithelial cell height of fish fed T_3^4 or T_3^{20} was either suppressed or enhanced. MT^1 singly or combined with T_3 induced androgenic side effects in males. Proximate body composition was affected only by MT. T_3^{20} induced morphological anomalies and treatment was discontinued. In May, thyroid activity and number of putative gonadotrops of fish fed MT^1 were increased. Androgenic effects of all groups given MT^1 were greater in May than in February. After SW transfer in February growth, appetite, and food utilization were depressed but fish fed T_3^4 performed better than controls. Performance of all groups improved after May but, in general, mortality increased slightly. After transfer in May, T_3-fed fish had increased growth in length. It is concluded that MT and T_3 effectively enhance growth in FW but only T_3 facilitates SW transfer.

80-002466 Ghittino, P. MORTALITA' DA CAUSE NON IDENTIFICABILI IN TROTICOLTURA E SUA INCIDENZA PERCENTUALE. [MORTALITY (IN PERCENT) BY UNIDENTIFIED FACTORS IN FISH FARMING.] *Riv. It. Piscic. Ittiop.* 15(2):33-35. Apr.-May-June 1980. In Italian with English summ. SFA 25(4)

[Ist. Zooprof. Sper., Via Bologna, 148-10154 Torino, Italy] In fish farming, in spite of the propress in scientifical knowledges recently achieved, it's still necessary to consider mortalities deriving from unidentified factors (alias, «natural mortalities»). The author shortly reviewed such mortalies in order to provide an useful guideline for

TROUT AND SALMON CULTURE (CONTINUED)

80-002466 CONTINUED quantifying productions in trout farming and also to suggest criteria to apply in establishing fiscal parameters for that zootechnical venture. Basing on bibliographic data and on data emerging from a preliminary survey performed in some Italian commercial trout farms, it appears as advisable to consider that natural losses amount (roughly) to 15% in brood trout, to 25% in trout eggs, to 30% until fingerling stage, and to 30% before harvesting. Practically, it can be presumed that, by starting from trout eggs, only a 25% of egg number will reach salable trout.

80-002467 Halverson, C. J.; J. W. Jensen and C. E. Boyd. WATER QUALITY IN STANDING-WATER PONDS FOR WINTER PRODUCTION OF RAINBOW TROUT IN ALABAMA. *Trans. Am. Fish. Soc.* 109(3):310-313. May 1980. SFA 25(4)
[Fish Breeders, P.O. Box 448, Niland, CA 92257]

80-002468 Haywood, G. P.; J. R. Brett and J. M. Blackburn. ACCUMULATION OF EXCRETORY PRODUCTS AND EFFECT ON GROWTH OF YEARLING COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN GRADUALLY INCREASING RECIRCULATED WATER. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 946. iv + 17p. June 1980. In English with French summ. SFA 25(4)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Coho salmon, averaging 97 g initial weight, were subjected to recycling of reaerated water (15 °C) at an increasing proportion, starting at 50% recirculation and continuing to a final 100% for a brief period. Total ammonia, unionized ammonia, urea, pH and oxygen were monitored throughout the 237-day experiment. A difference in growth rate between test fish and controls was apparent towards the end of the 80% recirculation period. An average decrease of 15% in weight occurred at this and higher levels of staged recirculation. During the 95% recirculation period (31 days), at a fish density of 25 lb/gpm, total ammonia reached 2.6 ppm, unionized ammonia was 3.6 ppb at a pH of 6.5, urea was 0.7 ppm, and O_2-concentration averaged 5.8 ppm. The final levels of these environmental parameters during 12 days of 100% recirculation were: 3.3 ppm total ammonia, 4.7 ppb unionized ammonia, 0.5 ppm urea, 6.5 pH and 4.5 ppm O_2. Nitrite poisoning was observed during the last stage, causing some mortalities; a single measurement revealed a level of 3.5 ppm nitrite at termination of the test. It is concluded that up to 70% recirculation with reaeration did not generate sufficient environmental degradation from excretory products to induce a significant decrease in growth rate of yearling coho salmon under the conditions and duration imposed.

80-002469 Hiroi, O. [ON THE WATER-WASHING TIME OF CHUM SALMON EGGS SOON AFTER THE ARTIFICIAL FERTILIZATION.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 34. p. 115-120. Mar. 1980. In Japanese with English summ. SFA 25(4)
[Hokkaido Salmon Hatchery, Fish. Agency, 2-2 Nakknoshima, Toyohiruku, Sapporo, Hokkaido, Japan 062]

80-002470 Hosmer, M. J. HANDLING AS A FACTOR IN MORTALITY OF TROUT WITH OR WITHOUT FURUNCULOSIS. *Prog. Fish-Cult.* 42(3):157-159. July 1980. SFA 25(4)
[U.S. FWS, Natl. Fish. Cent., Kearneysville, WV 25430]

80-002471 Lagasse, J. P.; D. A. Leith; D. B. Romey and O. F. Dahrens. STAMINA AND SURVIVAL OF COHO SALMON REARED IN RECTANGULAR CIRCULATING PONDS AND CONVENTIONAL RACEWAYS. *Prog. Fish-Cult.* 42(3):153-156. July 1980. SFA 25(4)
[Oreg. Dep. Fish Wildl., Sandy Lab., 39800 SE Fish Hatchery Rd., Sandy 97055]

TROUT AND SALMON CULTURE (CONTINUED)

80-002472 Magomedov, G. M.; G. K. Azhigaliyeva and S. N. Popovichenko. FIRST RESULTS OF THE USE OF THE CHALNIK EGG INCUBATOR FOR THE INTRODUCITON OF AUTUMN CHUM SALMON, *ONCORHYNCHUS KETA*, INTO THE CASPIAN SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikthiol.)* 19(3):167-171. 1979. SFA 25(4)
[Dagestan Dep., Caspian Fish. Res. Inst., Makhachkala, USSR]

80-002473 Mandis, T. ALTERATION OF PHOTOPERIODS TO INDUCE EARLY SPAWNING IN RAINBOW TROUT. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:24-27. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)

Fish management objectives in Colorado require that certain sizes and numbers of trout be available throughout the year. With normal spawning taking place from October to January, however, these objectives are usually very difficult to meet. The spawning period for hatchery rainbow trout (*Salmo gairdneri*) is affected by many factors--waters, temperature, genetics, photoperiod, etc. Research in environment and genetics will continue to play an important part in the propagation of salmonids. However, the potential for varying the length of the spawning time by controlling photoperiods is the most promising technique for the immediate future.

80-002474 Werder, U. LABORATORY INCUBATION SYSTEM FOR SALMONID EGGS. *Prog. Fish-Cult.* 42(3):190-191. July 1980. SFA 25(4)
[Inst. Nac. Pesq. Amazonia, Caixa Post. 478, Dep. Fish Cult., 69.000 Manaus-AM, Brasil]

WARMWATER CULTURE

80-002475 Ang Kok Jee. SOME PROBLEMS IN THE CAGE CULTURE OF MARBLE GOBY (*OXYELEOTRIS MARMORATA* BLEEKER). *Aquaculture* 20(3):229. July 1980. Abstract only. SFA 25(4)

[Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia] The cage culture project for marble goby (*Oxyeleotris marmorata* Bleeker) was initiated at the Universiti Pertanian Malaysia Fish Pond Complex in April 1978. The fish were stocked in floating net cages at four stockings rates: 30, 50, 70, and 90 fish/cage. Each net cage measured 2 m X 1.5 m X 1m. The net was of nylon material of 1.8 cm mesh size. The first trial was terminated in June 1978 due to high mortality caused by a protozoan parasite, *Trichodina* sp. Several problems were faced in culturing this fish in the University Pond Complex. One of them was the difficulty in obtaining fish seed of the right size for the trial. There were some predators such as *Channa striata* and water snake which caused some mortality to the fish and damage to the cage nets. Though fouling was not a serious problem, silt deposition and algal growth on the net might cause some problems if no regular cleaning is done. Preparations are now under way to produce enough seeds for the next trial.

80-002476 Cruz, E. M. and I. L. Laudencia. POLYCULTURE OF MILKFISH (*CHANOS CHANOS* FORSKAL), ALL-MALE NILE TILAPIA (*TILAPIA NILOTICA*) AND SNAKEHEAD (*OPHICEPHALUS STRIATUS*) IN FRESHWATER PONDS WITH SUPPLEMENTAL FEEDING. *Aquaculture* 20(3):231-237. July 1980. SFA 25(4)

[Freshwater Aquacult. Cent., Cent. Luzon State Univ., Nueva Ecija, Philippines] Results showed that all-male Nile tilapia can be cultured in milkfish ponds without affecting the growth and production of milkfish, at ratios of 1-3 tilapia to 5 milkfish; 2:5 is the optimum ratio. Supplemental feeding with fine rice bran or copra meal at a daily rate of 5% of the biomass increased the net production of milkfish but had no influence on all-male Nile tilapia. Standing crop of about 890 kg/ha in 135 days was obtained in a polyculture system of milkfish, all-male Nile tilapia and snakehead when fed rice bran.

WARMWATER CULTURE (CONTINUED)

80-002477 Curry, K. D. and A. Spacie. TEMPERATURE-CONTROLLED RECIRCULATING SYSTEM FOR HATCHING CATOSTOMID LARVAE. *Prog. Fish-Cult.* 42(3):151-152. July 1980. SFA 25(4)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

80-002478 Detlaf, T. A. and S. I. Davydova. THE EFFECT OF TRIIODOTHYRONINE ON THE MATURATION OF THE OOCYTES OF THE SEVRYUGA, *ACIPENSER STELLATUS*, UNDER THE INFLUENCE OF THE GONADOTROPIC HORMONES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):105-110. 1979. SFA 25(4)
[N. K. Kol'tsov Inst. Dev. Biol., USSR Acad. Sci., Moscow, USSR]

80-002479 Hogendoorn, H. and M. M. Vismans. CONTROLLED PROPAGATION OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C. & V.). II. ARTIFICIAL REPRODUCTION. *Aquaculture* 21(1):39-53. Sept. 1980. SFA 25(4)
[Dep. Fish Cult. Inland Fish., Agric. Univ., P.O. Box 338, Wageningen, The Netherlands] To optimize the artificial reproduction of *C. lazera* for aquaculture, experiments were carried out on short-term sperm conservation as well as hypophysation and stripping of the females. When the sperms were stored at 5°C for 24 h, their fertilizing capability was reduced by 4% compared with freshly obtained sperm. However, dilution in a 0.9% NaCl solution (up to $1/10^3$) gave an average 9% increase of hatching success. This finding enables the use of one competent male to fertilize the eggs of many females. An alternative application of the finding enables homoplastic hypophysation, using the fresh pituitary of the male to induce ripening of the female, while the sperms are stored for later use. Correct timing of stripping of the females in relation to hypophysation proved to be critical for obtaining good hatching results. This was increasingly so when temperatures were high. The best results in these experiments were obtained when stripping took place 21, 11 or 7 h after hypophysation at 20, 25 and 30°C, respectively. At this time the eggs were flat, with the cytoplasm concentrated at the animal pole as a reddish-brown spherical cap. The incubation period of the eggs decreased with increasing temperature. In all instances a large proportion of deformed fry occurred which was inversely related to the hatching percentage. Incubation without a regular water exchange gave 4% more hatching, 6% less deformation and a shorter incubation period than incubation with water exchange. Hypophysation was repeated four times with 1-, 2- or 3-week intervals and resulted in successful stripping, fertilization and hatching of the eggs after each hypophysation.

80-002480 Hollerman, W. D. and C. E. Boyd. NIGHTLY AERATION TO INCREASE PRODUCTION OF CHANNEL CATFISH. *Trans. Am. Fish. Soc.* 109(4):446-452. July 1980. SFA 25(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

80-002481 Matsuno, T.; M. Katsuyama; M. Iwahashi; T. Koike and M. Okada. INTENSIFICATION OF COLOR OF RED *TILAPIA* WITH LUTEIN, RHODOXANTHIN AND SPIRULINA. *Bull. Jpn. Soc. Sci. Fish.* 46(4):479-482. Apr. 1980. WR 179
[Kyoto Coll. Pharm., Misasagi, Yamashina-ku, Kyoto 607, Japan]

80-002482 McGinty, A. S. SURVIVAL, GROWTH AND VARIATION IN GROWTH OF CHANNEL CATFISH FRY AND FINGERLINGS. *Ph.D. dissertation, Auburn Univ.* 74p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(1):5. July 1980. SFA 25(4)
Effects of insect control and stocking density on survival and growth of channel catfish fry were studied in 9 ponds (0.04-ha) stocked with 2,000, 8,000 or 14,000 fry. Prior to stocking, one pond per density was treated with

WARMWATER CULTURE (CONTINUED)

80-002482 CONTINUED either methyl parathion, Dylox or diesel fuel to control aquatic insects. Zooplankton abundance was determined before and after stocking. Fry survival at low, medium and high stocking densities was 79, 94 and 98% for methyl parathion; 93, 83 and < 1% for Dylox; and 0, 0 and 0% for diesel fuel treated ponds, respectively. Predation by odonate nymphs was responsible for no survival in ponds treated with diesel fuel. Fry survival increased as zooplankton abundance increased. As harvest number increased, standing crop increased while mean length and weight decreased. Fry were more uniform in length from ponds with low and medium densities than high densities. Effects of food particle size on lengths of channel catfish fry were studied in hapas and troughs. Fry were fed either a 2 to 3 mm diameter pellet or a finely ground meal. Fry in 3 hapas received no supplemental food. Fry mortality was high in all hapas and fry fed meal or not fed were shorter and more variable than fry fed pellets. Meal apparently passed though the hapas and was not available for consumption. In troughs, survival was greater for fry fed meal than those fed pellets. There was no differences in uniformity between treatments. Fry fed pellets were more positively skewed than fry fed meal. Effects of stocking density and feeding rate on growth of channel catfish fingerlings were studied in ponds and troughs. In 8 ponds, 3,400 fingerlings/pond were fed either 0.5 or 5.0% total body weight daily. Twelve troughs were stocked with either 30 or 250 fingerlings/trough and fed either 1 or 5% total body weight daily. Fingerlings fed a high rate or cultured at low densities increased in length and weight faster than those fed at a low rate or cultured at low densities. Variation in length increased as mean length increased regardless of feeding rate or stocking density. Lengths of fish fed at low rates were more positively skewed than fish fed high rates. There was no difference in skewness between lengths of fish stocked at low and high densities. In conclusion, increasing consumption by feeding rations of unsuitable size for consumption by all individuals or by feeding insufficient quantities of food did not affect the uniformity of the population but did result in a few individuals of larger size causing length distributions to be more positively skewed.

80-002483 Ogurtsov, G. I. ECOLOGICAL SIGNIFICANCE OF THE WINTER BEDDING OF CARP FINGERLINGS. *Sov. J. Ecol. (Engl. Transl. Ekologiya)* 10(5):441-443. May 1980. SFA 25(4)

80-002484 Rifai, S. A. CONTROL OF REPRODUCTION OF *TILAPIA NILOTICA* USING CAGE CULTURE. *Aquaculture* 20(3):177-185. July 1980. SFA 25(4)
[Fac. Agric., Panjadjaran Univ., Bandung, Indonesia] Experiments were conducted to control reproduction of *Tilapia nilotica* using cage culture compared with growth and reproduciton in ponds. Three rearing densities (5, 15, and 45 fish percage), and three kinds of aquatic plant (*Hydrilla* sp., *Lemna* sp., and *Chara* sp.) were used as feed. Results of the study showed that *Tilapia* reproduced in both cages and ponds; however, the intensity of reproduction was low. Growth rates of fish reared in cages were higher than those of fish reared in ponds. *Lemna* sp. as feed gave the best results in terms of growth rate and protein content of fish flesh. There was no interaction between feed and rearing density.

80-002485 Sinha, V. R. P. HYDRATION OF FEMALE SPAWNERS OF CARPS DURING HYPOPHYSATION. *Hydrobiologia* 72(1-2):193-196. 10 July 1980. SFA 25(4)
[Freshwater Aquacult. Res. Training Cent., 624 Saheed Nagar, Bhubaneswar 751007, India] Those female major carps which gained weight after injection of pituitary extract to induce spawning, ovulated more successfully than those which did not. In practice, therefore, fishes which lose weight up to the second of the two injections customarily given, may not be injected further. The gain in weight is caused by induced hydration of the spawner.

WARMWATER CULTURE (CONTINUED)

80-002486 Tan, E. S. P. SOME ASPECTS OF THE BIOLOGY OF MALAYSIAN RIVERINE CYPRINIDS. *Aquaculture* 20(3):281-289. July 1980. SFA 25(4)

[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia] Four indigenous riverine carps, namely *Leptobarbus hoeveni*, *Tor tambroides*, *Puntius daruphani* and *Puntius bulu*, currently command a good market price in Malaysia. The potential of these species for culture was assessed by both field and experimental studies. Basic information essential for future breeding programmes of these species was obtained. The findings suggest that some of these species could prove to be useful new species for future aquaculture programmes.

MARICULTURE

80-002487 Chua, T. E. and S. K. Teng. ECONOMIC PRODUCTION OF ESTUARY GROUPER, *EPINEPHELUS SALMOIDES* MAXWELL, REARED IN FLOATING NET CAGES. *Aquaculture* 20(3):187-228. July 1980. SFA 25(4)

[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia]

80-002488 Smith, T. I. J.; E. K. Dingley and D. E. Marchette. INDUCED SPAWNING AND CULTURE OF ATLANTIC STURGEON. *Prog. Fish-Cult.* 42(3):147-151. July 1980. SFA 25(4)

[S.C. Mar. Resour. Res. Inst., P.O. Box 12559, Charleston 29412]

FEEDS, FEEDING, AND NUTRITION

80-002489 Beck, A. D. and H. A. Poston. EFFECTS OF DIET ON SURVIVAL AND GROWTH OF THE ATLANTIC SILVERSIDE. *Prog. Fish-Cult.* 42(3):138-143. July 1980. SFA 25(4)

[U.S. Environ. Prot. Agency, Narragansett, RI 02882]

80-002490 Biette, R. M. and G. H. Geen. THE FATE OF ^{14}C LABELED FOOD INGESTED BY UNDERYEARLING SOCKEYE SALMON, *ONCORHYNCHUS NERKA*, IN RELATION TO TEMPERATURE AND RATION. *Can. J. Fish. Aquatic Sci.* 37(7):1184-1192. July 1980. SFA 25(4)

[Fish. Br., Ontario Minist. Nat. Resour., Queen's Park, Toronto, ON M7A 1W3, Canada]

80-002491 Bowen, S. H. NON-PROTEIN DETRITAL AMINO ACIDS ARE THE KEY TO RAPID GROWTH OF TILAPIA (PISCES, CICHLIDAE) IN LAKE VALENCIA, VENEZUELA. *Bull. Ecol. Soc. Am.* 61(2):151-152. June 1980. Abstract only. SFA 25(4)

[Mich. Technol. Univ., Houghton] Amino acids in the diet of the detritivorous cichlid fish *Sarotherodon massambicus* are present in both protein and non-protein forms. Most proteins appear to be constituants of living microbes while non-protein amino acids appear to be constituants of detritus. *S. mossambicus* possess special adaptations for digestion of both amino acid sources. In Lake Valencia, *S. mossambicus* achieves, rapid growth on a low protein diet by selective grazing on detritus with a high total amino acid content.

80-002492 Castel, J. D. and K. Tiews. REPORT OF THE EIFAC, IUNS AND ICES WORKING GROUP ON STANDARDIZATION OF METHODOLOGY IN FISH NUTRITION RESEARCH. *EIFAC (Eur. Inland Fish. Advis. Comm.) Tech. Pap.* No. 36. v + 24p. 1980.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-002492 CONTINUED SFA 25(4)
[Dep. Fish. Oceans, P.O. Box 550, Halifax, NS B3J 2S7, Canada]

80-002493 Dahlgren, B. T. THE INFLUENCE OF THREE DIETARY NON-PROTEIN LEVELS ON FECUNDITY AND FERTILITY IN THE GUPPY *POECILIA RETICULATA*. *Oikos* 34(3):337-346. May 1980. In English with Russian summ. SFA 25(4)

Feeding experiments were carried out to examine the effects of different amounts of dietary non-protein (carbohydrates and lipids) on fecundity and fertility in the guppy, *Poecilia reticulata* (Peters). There were no significant differences in total body length between females given different amounts of non-protein food, but females given 85% non-protein diet had a significantly higher standard length than females given 69 or 53% non-protein components. A significantly higher total body weight was also found in the groups fed on 85% non-protein diet than among females given 53% non-protein. The frequencies of females with only intrafollicular embryos or with both embryos and ova alternatively with only previtellogenic oocytes in the ovary were not significantly different between populations fed on different non-protein contents. In the group given 69% non-protein the frequency of females with only ova was significantly higher than among females fed on 53% non-protein. The ovarian width, ovarian volume and gonad weight were all significantly higher in females given 85% non-protein than in females fed on 53% non-protein. There were no significant differences of fecundity and fertility between any groups given different amounts of non-protein (85, 69 and 53%). This was also true for embryo size and ovum diameter.

80-002494 Fowler, L. G. STARTING DIETS FOR CHINOOK SALMON FRY. *Prog. Fish-Cult.* 42(3):165-166. July 1980. SFA 25(4)
[Abernathy Salmon Cult. Dev. Cent., 1440 Abernathy Rd., Longview, WA 98632]

80-002495 Fukusho, K.; T. Arakawa and T. Watanabe. [FOOD VALUE OF A COPEPOD, *TIGRIOPUS JAPONICUS*, CULTURED WITH ω-YEAST FOR LARVAE AND JUVENILES OF MUD DAB *LIMANDA YOKOHAMAE*.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):499-503. Apr. 1980. In Japanese with English summ. SFA 25(4)
[Natl. Res. Inst. Aquacult., Tamaki-cho, Mie 519-04, Japan]

80-002496 Ghittino, P. CONTROLLO DELLA CONVENIENZA, TOSSICITA E CANCEROGENICITA DI TOPRINA NELLA TROTA IRIDEA RAPPORTO FINALE. [CHECKING ON THE SUITABILITY, TOXICITY AND CANCEROGENICITY OF *TOPRINA* IN RAINBOW TROUT. FINAL REPORT.] *Riv. It. Piscic. Ittiop.* 15(2):36, 39-42, 45. Apr.-May-June 1980. In Italian with English summ. SFA 25(4)
[Ist. Zooprof. Sper., Via Bologna, 148-10154 Torino, Italy]

80-002497 Guerrero, R. D. III. STUDIES ON THE FEEDING OF *TILAPIA NILOTICA* IN FLOATING CAGES. *Aquaculture* 20(3):169-175. July 1980. SFA 25(4)
[Coll. Inland Fish., Cent. Luzon State Univ., Nueva Ecija, Philippines]
Five studies on the feeding of *Tilapia nilotica* in floating cages were conducted. Stocking densities of 100 to 200 fish per m^3 were used. Only commercially available ingredients were used in the feed. Results of the studies showed that diets containing fish meal, fine rice bran and copra meal had significantly better feed conversion ratios than diets with ipil-ipil leaf meal. Diets with 25% fish meal and 10% copra meal were found to be efficient and economical for *T. nilotica*. Chicken grower mash enriched with fish meal did not significantly differ from a diet consisting of 25% fish meal and 75% fine rice bran. Fish given moist pellets had significantly higher production than fish fed with dry pellets.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-002498 Hung, S. S. O.; C. Y. Cho and S. J. Slinger. MEASUREMENT OF OXIDATION IN FISH OIL AND ITS EFFECT ON VITAMIN E NUTRITION OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Can. J. Fish. Aquatic Sci.* 37(8):1248-1253. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

80-002499 Kanid'yev, A. N. and V. Ya. Sklyarov. DEVELOPMENT OF EFFICIENT GRANULATED FEEDS FOR THE RAINBOW TROUT, *SALMO GAIRDNERI*, BASED ON VEGETABLE AND BACTERIAL PROTEIN WITH SYNTHETIC AMINO ACIDS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):140-146. 1979. SFA 25(4)
[VNIIPRKh, Rybnoye Post. Dist., Moscow Prov., USSR] With the object of reducing the cost of high-quality granulated feeds for the rainbow trout, *Salmo gairdneri*, trials were conducted on the replacement of animal protein by an adequate amount of vegetable and bacterial protein from sunflower oil cake, and hydrolyzed and carbonaceous yeasts (PVC -protein-vitamin concentrate). The resulting deficiency of "key" amino acids (lysine and methionine) was compensated by their synthetic analogs. The possibility of providing the trout with vitamins of group B from the PVC was verified. As a result of testing food mixtures it was established that losses of animal protein per unit of growth were reduced by almost 10 times, and the cost of the unit of growth reduced by 33%. Although the rate of growth of the trout decreased by 10%, the efficiency of commercial rearing increased considerably.

80-002500 Kaushik, S. and P. Luquet. ÉTUDE DE LA DIGESTIBILITÉ DES ACIDES AMINÉS DE RÉGIMES A BASE DE ZÉINE CHEZ LA TRUITE ARC-EN-CIEL. [STUDY OF THE AMINO ACIDS DIGESTIBILITY OF ZEIN DIETS IN RAINBOW TROUT.] *Ann. Hydrobiol.* 7(1):11-19. 1976. In French with English summ. SFA 25(4)
[Lab. Nutr. Poissons, I.N.R.A., Cent. Natl. Rech. Zootech., 78350 Jouy en Josas, France] The coefficients of apparent digestibility (CUD) of amino acids in rainbow trout were studied using semi-purified diets having zein or a mixture of zein-fishmeal as the principal protein sources. The results of this experiment indicate that the protein digestibility value of the diets having both the protein sources is good (92 p. 100) and is superior than the one containing only zein (89 p. 100). The digestibility of individual amino acids in the different diets reflect in general this pattern, but for those added in free form in the diet. Thus, arginine is more easily digested (93 p. 100) from the diet having both zein and fish meal than from the one having only zein (85 p. 100). Supplementation of 2.6 p. 100 of this amino acid in crystalline form to the former diet increases the CUD of arginine to 97.5 p. 100. In the light of its high digestiblility values, zein duly completed or supplemented appears to be a very good tool of research for amino acid requirement studies.

80-002501 Ogino, C. and G.-Y. Yang. [REQUIREMENTS OF CARP AND RAINBOW TROUT FOR DIETARY MANGANESE AND COPPER.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):455-458. Apr. 1980. In Japanese with English summ. SFA 25(4)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato-ku, Tokyo 108, Japan] Carp, *Cyprinus carpio*, and rainbow trout, *Salmo gairdneri*, were fed on the diets containing different amounts of Mn and Cu for 12 to 16 weeks, respectively. The feeding with the low Mn-diet (4 ppm Mn) resulted in lower growth rate than the control diet (12-13 ppm Mn) in both fish species. In the rainbow trout, the malformation such as an abnormal growth of the tail and the shortening of the body length developed in the fish receiving the low Mn-diet. The development of the malformation was considered to be due to the abnormal formation of the bones by the Mn-deficiency. The low Cu-diet (0.7 ppm Cu) produced lower growth rate than the control diet (3 ppm Cu) in the Carp and not in the rainbow trout. The contents of Mn and Cu in the tissues from the fish fed with the low Mn- or low Cu-diet decreased distinctly in

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-002501 CONTINUED both fish species. Judging from the experimental results, the optimum dietary levels of Mn and Cu were considered to be around 12-13 ppm and around 3 ppm, respectively, in both the carp and the rainbow trout.

80-002502 Pfeffer, E.; R. Petrasch and O. Eckhardt. UNTERSUCHUNGEN ÜBER MÖGLICHE PROTEIN- UND FETTTRÄGER IN GEREINIGTEN DIÄTEN FÜR REGENBOGENFORELLEN (*SALMO GAIRDNERI*, R.). [STUDIES ON POSSIBLE SOURCES OF PROTEIN AND FAT IN PURIFIED DIETS FOR RAINBOW TROUT (*SALMO GAIRNDERI*, R.).] *J. Anim. Physiol. Anim. Nutr.* 43(4-5):254-263. 1980. In German with English summ. SFA 25(4)
[Univ. Göttingen, West Germany]

80-002503 Skrede, A.; Å. Krogdahl and E. Austreng. DIGESTIBILITY OF AMINO ACIDS IN RAW FISH FLESH AND MEAT-AND-BONE MEAL FOR THE CHICKEN, FOX, MINK AND RAINBOW TROUT. *J. Anim. Physiol. Anim. Nutr.* 43(2):92-101. Feb. 1980. In English with German summ. SFA 25(3)
[Dep. Poultry Fur Anim. Sci., Agric. Univ. Norway, AS-NLH, Norway]

80-002504 Spataru, P.; B. Hepher and A. Halevy. THE EFFECT OF THE METHOD OF SUPPLEMENTARY FEED APPLICATION ON THE FEEDING HABITS OF CARP (*CYPRINUS CARPIO* L.) WITH REGARD TO NATURAL FOOD IN PONDS. *Hydrobiologia* 72(1-2):171-178. 10 July 1980. SFA 25(4)
[Fish Aquacult. Res. Stn., Dor, Israel] Qualitative and quantitative analyses were carried out on the intestinal content of 408 carps of age 0+ collected from ponds manured with liquid cowshed manure, with or without the addition of supplementary feed. These analyses were combined with a study of the benthos in the same ponds. Conclusions drawn were that the natural food preferred by this fish species consists of the components of the zoobenthos, especially larvae and pupae of chironomids. When the carp were fed supplementary feed through a demand feeder, the natural food consumed was mainly from the surface layers of the water, such as pupae of chironomids at the last stage of their development, before or during the hatching of the adult, Heteroptera, and also Cladocera, Copepoda and Rotatoria from the zooplankton. The daily addition of liquid cow manure caused harsher environmental conditions in the water, led to a decrease in the number of species of the benthos and of the plankton, and consequently had an influence on the trophic spectrum of the carp. Supplementary feed when available, replaces some of the natural food and it seems that the carp seeks more easily accessible food items.

80-002505 Takeuchi, L.; T. Takeuchi and C. Ogino. [RIBOFLAVIN REQUIREMENTS IN CARP AND RAINBOW TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 46(6):733-737. June 1980. In Japanese with English summ. SFA 25(4)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato-ku, Tokyo 108, Japan]

80-002506 Willis, D. W. and S. A. Flickinger. TRAINING SUCCESS OF BROOK AND BROWN TROUT ONTO A PREPARED DIET. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:42-46. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[Dep. Fish. Wildl., Colo. State Univ., Fort Collins 80523] Training success of brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) fry was determined using three training diet sequences: ground beef liver to Biodiet, carp (*Cyprinus carpio*) eggs to Biodiet, and Biodiet alone. Mean training success of the brown trout onto the liver sequence was 93.5 percent, to the carp egg sequence was 98.5 percent, and to the Biodiet alone was 97.5 percent. Mean training success of the brook trout onto the liver sequence was 73.5 percent, to the carp egg sequence was 71.0 percent, and to the Biodiet

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

80-002506 CONTINUED alone was 73.0 percent. No significant differences among diet sequences were found for the brown trout or the brook trout.

AQUARIUMS

80-002507 Dillon, C. (ed.). ZOOS AND AQUARIUMS IN THE AMERICAS 1980-1981. 256p. 1980. Available @ $15.00 from American Assoc. Zoological Parks and Aquariums, Oglebay Park, Wheeling, WV 26003. SFA 25(4)

80-002508 Jensen, N. J. SYSTEM OF INDIVIDUALLY TEMPERATURE-REGULATED SALTWATER AQUARIA. *Prog. Fish-Cult.* 42(3):166-168. July 1980. SFA 25(4)
[R. Vet. Agric. Univ., Lab. Aquatic Pathobiol., Bülowsvej 13, DK-1870 Copenhagen V, Denmark]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

80-002509 Khoo Khay Huat. STIMULATION OF OVARIAN MATURATION IN FISH BY SUSTAINED HORMONE PREPARATIONS. *Aquaculture* 20(3):275-280. July 1980. SFA 25(4)
[Sch. Biol. Sci., Univ. Sains Malaysia, Minden, Penang, Malaysia] Ovarian maturation of *Carassius auratus* and *Ophiocephalus striatus* was attempted using human chorionic gonadotrophin (HCG) pellets and cholesterol pellets as a control. Fish were kept under photoperiod and natural conditions. Implantations of HCG induced a significant increase in the gonadosomatic index of female fish kept in total darkness, and in natural conditions. At the end of 6 weeks the fish treated with HCG had both Stage I and Stage II oocytes, and development within Stage II to the yolk granula and fatty yolk oocyte stages. The author recommended the sustained-release preparation technique for inducing spawning in fish difficult to breed.

80-002510 Mandal, B. K. and C. E. Boyd. REDUCTION OF pH IN WATERS WITH HIGH TOTAL ALKALINITY AND LOW TOTAL HARDNESS. *Prog. Fish-Cult.* 42(3):183-185. July 1980. SFA 25(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

80-002511 Robinson, T. THE MICROCOMPUTER AS A TOOL OF FISH CULTURE. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:97-98. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)
[Colo. Div. Wildl., Glenwood Springs]

80-002512 Withler, F. C. CHILLED AND CRYOGENIC STORAGE OF GAMETES OF THAI CARPS AND CATFISHES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 948. iii + 15p. June 1980. In English with French summ. SFA 25(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Fertilizabilities of ova and sperm of Indian carp *Labeo rohita*, common carp *Cyprinus carpio*, Puntius *Puntius gonionotus*, grass carp *Ctenopharyngodon idella*,

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

80-002512 CONTINUED bighead carp *Aristichthys nobilis* and the catfish *Pangasius sutchi* were examined after storage in refrigerators or on ice or in liquid nitrogen (LN_2). The period of fertilizability of ova after extrusion was not extended significantly by chilled storage in a refrigerator. The period during which sperm could be activiated after extrusion was extended to several hours by chilled storage in syringes. Carp sperm (Indian carp, common carp, Puntius, bighead carp) mixed with an extending solution containing DMSO could be activated after storage for various periods in LN_2. In one trial, Indian carp sperm stored in LN_2 fertilized ova as well as fresh sperm applied to a control group of ova. *P. sutchi* sperm in either of the two extenders used, and stored in LN_2, produced a gel which could not be used effectively in fertilizing ova. A description of current methods of inducing maturation by injection of macerated pituitary glands is given. Recommendations are made for further work on gamete storage applicable to Thai fish culture.

GENERAL LIMNOLOGY AND OCEANOGRAPHY

80-002513 Carlson, J. B. and G. E. Ahlgren. A TECHNIQUE FOR COLLECTING WATER SAMPLES UNDER EXTREME WINTER CONDITIONS. *J. Minn. Acad. Sci.* 46(1):16-17. 1980. SFA 25(4)

[Dep. Biol., Univ. Minn., Duluth] The construction and use of a simple water sampler for winter limnological studies is described. Data presented indicate that water samples taken with this device and by a mechanical hand-operated suction pump over a wide range of temperatures do not differ significantly (P is less than 0.05, t-test) in the dissolved oxygen concentration determined by the Winkler titration. Certain distinct advantages of a static water sampler are discussed.

80-002514 LaBounty, J. F. and J. J. Sartoris. THE EFFECTS OF DROUGHT VERSUS WET YEARS ON THE LIMNOLOGY OF LAKES AND RESERVOIRS IN COLORADO AND WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:99. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[U.S. Water Power Resour. Serv., Denver, CO] The Bureau of Reclamation has been monitoring several limnological parameters of Twin Lakes, Colorado and the uppermost North Platte Reservoirs, Wyoming, for the past 7 and 4 years, respectively. The occurrence of two drought and two wet years during the periods of study has provided the opportunity to assess the effects of low versus high runoff years on the limnology of the reservoirs. Analysis of data collected from these dissimilar aquatic ecosystems indicated that during the post-drought wet years, plankton populations increased from 6 to 10 times over what they were during the drought years. Twin Lakes are a pair of high-mountain, glacially-formed dimictic oligotrophic lakes, while the four reservoirs on the upper North Platte are high plains reservoirs which are mesotrophic. While both systems are similar in that they are heavily influenced by the amount of annual spring runoff, they differ greatly in their basic limnological features, such as physcial lake form, thermal structure, water chemistry, plankton species composition and abundance, and type of fishery. This paper discusses the similarities in the effects years with above average runoff and those with below average runoff have on these two dissimilar environments. It is expected since plankton populations were depressed during drought years and luxuriant during wet years, that the top carnivore would reflect their food source in abundance for the respective year classes.

GENERAL LIMNOLOGY AND OCEANOGRAPHY (CONTINUED)

80-002515 Sartoris, J. J. and J. F. LaBounty. LIMNOLOGY OF THE NORTH PLATTE RESERVOIR SYSTEM, WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:97. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901] Abstract only. SFA 25(4)
[U.S. Water Power Resour. Serv., Denver, CO]

PHYSICAL LIMNOLOGY AND OCEANOGRAPHY

80-002516 Kranck, K. VARIABILITY OF PARTICULATE MATTER IN A SMALL COASTAL INLET. *Can. J. Fish. Aquatic Sci.* 37(8):1209-1215. Aug. 1980. In English with French summ. SFA 25(4)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

80-002517 Lane, E. D. and R. G. Newstead. THREE-DIMENSIONAL COMPUTER MAPPING OF LAKES. *Prog. Fish-Cult.* 42(3):136-137. July 1980. SFA 25(4)
[Fish Cult. Prog., Malaspina Coll., Nanaimo, BC V9R 5S5, Canada]

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

80-002518 Boyd, C. E. and L. Tucker. DETERMINATION OF FILTRABLE ORTHOPHOSPHATE IN WATER FROM FISH PONDS. *Trans. Am. Fish. Soc.* 109(3):314-318. May 1980. SFA 25(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

80-002519 Campbell, P. and T. Torgersen. MAINTENANCE OF IRON MEROMIXIS BY IRON REDEPOSITION IN A RAPIDLY FLUSHED MONIMOLIMNION. *Can. J. Fish. Aquatic Sci.* 37(8):1303-1313. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

80-002520 Nakashima, B. S. THE CONTRIBUTION OF FISHES TO PHOSPHORUS CYCLING IN LAKES. *Ph.D. dissertation, McGill Univ. (Canada)* 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):822. Sept. 1980. SFA 25(4)

Several hypotheses concerning the role of fishes in influencing nutrient dynamics in freshwater ecosystems were examined in Lake Memphremagog (Quebec-Vermont). Phosphorus excretion by fishes provides a negligible amount (<0.33%) in comparison to the quantity taken up by the seston. The phosphorus pools present in the seston and fish community were approximately equal and both were twice the phosphorus content in the zooplankton. Part of this nutrient reservoir is released during the decompositon of fish carcasses. The potential is dependent upon post-spawning mortality rate, the fate of phosphorus in decomposing fish tissue, and the concentrations of allochthonous phosphorus entering the lake. Daily losses of epilimnetic phosphorus from the seston due to fish (up to 40%) and enhancement of nutrient excretion by zooplankton due to size-selective predation are important when open water fish populations are mainly planktivores. When benthic, detrital, or faculative consumers predominate, as in Lake Memphremagog, the effect of fishes on nutrient dynamics through foraging pressue is probably small.

BENTHOS

80-002521 Hulberg, L. W. and J. S. Oliver. CAGING MANIPULATIONS IN MARINE SOFT-BOTTOM COMMUNITIES: IMPORTANCE OF ANIMAL INTERACTIONS OR SEDIMENTARY HABITAT MODIFICATIONS. *Can. J. Fish. Aquatic Sci.* 37(7):1130-1139. July 1980. SFA 25(4)
[Moss Landing Mar. Lab., P.O. Box 223, Moss Landing, CA 95039]

80-002522 Molles, M. C., Jr. RECOVERY OF STREAM INVERTEBRATES FROM DISTURBANCE RESULTING FROM A FLASH FLOOD. *Bull. Ecol. Soc. Am.* 61(2):96. June 1980. Abstract only. SFA 25(4)
[Univ. N. Mex., Albuquerque] In mid-August 1977 a flash flood disrupted the benthic community of one of two forks of Tesuque Creek, Santa Fe National Forest, New Mexico. A study of the disturbed stream was undertaken to 1) determine the rate of recovery of benthic invertebrates and 2) compare rates of recovery upstream and downstream from the undisturbed fork. One year after the disturbance, the invertebrate communities of the flooded and unflooded sites were similar in biomass, numbers of individuals, and numbers of species. However, some differences in composition of the benthos remained. Trichoptera and Coleoptera appeared to recover most slowly from the effects of the flood. It is suggested that these two orders may be useful as indicators of the flow stability of streams. Recovery appeared to proceed at approximately equal rates upstream and downstream from the undisturbed fork.

80-002523 Parker, J. I. PREDATION BY *MYSIS RELICTA* ON *PONTOPOREIA HOYI*: A FOOD CHAIN LINK OF POTENTIAL IMPORTANCE IN THE GREAT LAKES. *J. Great Lakes Res.* 6(2):164-166. 1980. SFA 25(4)
[Ecol. Sci. Sect., Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL 60439] Sediment cores composed of benthic microorganisms and the natural assemblage of benthic fauna from Lakes Michigan and Erie were maintained intact at 4°C in a laboratory incubator for 10 weeks. Visual inspection of the microcosms showed that the opossum shrimp *Mysis relicta*, an omnivorous planktivore, frequently preyed on the burrowing amphipod *Pontoporeia hoyi*, a benthic detritivore; a previously unreported predator/prey relationship. Predation by *Mysis* on *Pontoporeia* demonstates that *Mysis* can utilize not only the plankton carbon pool but the benthic/detrital carbon pool as well. This relationship may represent an important link in the food web of the Great Lakes, since *Pontoporeia* is the dominant macrobenthic organism in the lakes and both organisms are an important source for immature salmonids and other fish species in the Great Lakes.

PLANKTON

80-002524 Bitton, G.; J. R. Beaver and S. R. Farrah. ORGANIC FLOCCULATION AND HYDROEXTRACTION: TWO NEW METHODS FOR PHYTOPLANKTON CONCENTRATION FROM LAKES. *Can. J. Fish. Aquatic Sci.* 37(8):1317-1320. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Environ. Eng., Univ. Fla., Gainesville 32611]

PRIMARY PRODUCTION

80-002525 Kwiatkowski, R. E. CHLOROPHYLL *a* MEASUREMENTS FROM LAKE

PRIMARY PRODUCTION (CONTINUED)

80-002525 CONTINUED ONTARIO, 1974-79. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 933. viii + 75p. May 1980. In English with French summ. SFA 25(4)
[Canada Cent. Inland Waters, 867 Lakeshore Rd., Burlington, ON L7R 4A6, Canada]

MORPHOLOGY

80-002526 Boëtius, J. ATLANTIC *ANGUILLA*. A PRESENTATION OF OLD AND NEW DATA OF TOTAL NUMBERS OF VERTEBRAE WITH SPECIAL REFERENCE TO THE OCCURRENCE OF *ANGUILLA ROSTRATA* IN EUROPE. *Dana* 1:93-112. 1980. SFA 25(4)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark]

80-002527 Alvarez-León, R. A SPECIMEN OF *LUTJANUS ARGENTIVENTRIS* (PETERS) LACKING PELVIC FINS. *J. Fish Biol.* 16(5):563-564. May 1980. SFA 25(4)
[Inderena, Subgerencia de Pesca, Bogotá, Colombia]

80-002528 Anthony, J. ÉVOCATION DES TRAVAUX FRANÇAIS SUR *LATIMERIA* NOTAMMENT DEPUIS 1972. [RECALLING FRENCH STUDIES OF *LATIMERIA* ESPECIALLY SINCE 1972.] *Proc. R. Soc. Lond. B Biol. Sci.* 208(1172):349-367. 17 July 1980. In French with English summ. SFA 25(4)
[Lab. Anat. Comp., Mus. Natl. Hist. Nat., 55 Rue de Buffon, 75-Paris-5, France]

80-002529 Bagiryan, S. Sh. and A. T. Terekhin. [AN EXPERIENCE OF USING MULTIVARIATE STATISTICAL METHODS FOR ANALYSIS OF THE INTRASPECIFIC STRUCTURE OF *SALMO MYKISS* WALBAUM (SALMONIFORMES, SALMONIDAE).] *Zool. Zh.* 59(6):859-869. June 1980. In Russian with English summ. SFA 25(4)
[Biol. Fac., State Univ. Moscow, USSR]

80-002530 Ballard, W. W. and A. S. Ginsburg. MORPHOGENETIC MOVEMENTS IN ACIPENSERID EMBRYOS. *J. Exp. Zool.* 213(1):69-103. July 1980. SFA 25(4)
[Biol. Dep., Dartmouth Coll., Hanover, NH 03755]

80-002531 Best, A. C. G. and J. A. B. Gray. MORPHOLOGY OF THE UTRICULAR RECESS IN THE SPRAT. *J. Mar. Biol. Assoc. U.K.* 60(3):703-715. Aug. 1980. SFA 25(4)
[Lab. Mar. Biol. Assoc., Citadel Hill, Plymouth, England]

80-002532 Burr, B. M. and M. S. Ellinger. DISTINCTIVE EGG MORPHOLOGY AND ITS RELATIONSHIP TO DEVELOPMENT IN THE PERCID FISH *ETHEOSTOMA PROELIARE*. *Copeia* 1980(3):556-559. 6 Sept. 1980. SFA 25(4)
[Dep. Zool., South Ill. Univ., Carbondale 62901]

80-002533 Buynak, G. L. and H. W. Mohr, Jr. LARVAL DEVELOPMENT OF STONEROLLER, CUTLIPS MINNOW, AND RIVER CHUB WITH DIAGNOSTIC KEYS, INCLUDING FOUR ADDITIONAL CYPRINIDS. *Prog. Fish-Cult.* 42(3):127-135. July 1980. SFA 25(4)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

MORPHOLOGY (CONTINUED)

80-002534 Chaturvedi, L. D.; B. D. Joshi and B. B. Sharma. THE TELENCEPHALIC FIBRE CONNECTIONS IN THREE FRESHWATER TELEOSTS. *J. Anim. Morphol. Physiol.* 26(1/2):177-181. June-Dec. 1979. SFA 25(4)
[P.G. Dep. Zool., Hindu Coll., Moradabad (U.P.), India]

80-002535 Collins, L. A.; J. H. Finucane and L. E. Barger. DESCRIPTION OF LARVAL AND JUVENILE RED SNAPPER, *LUTJANUS CAMPECHANUS*. *NOAA Fish. Bull.* 77(4):965-974. 1980. SFA 25(4)
[NMFS, 3500 Delwood Beach Rd., Panama City, FL 32407]

80-002536 Cooper, J. E. EGG, LARVAL AND JUVENILE DEVELOPMENT OF LONGNOSE DACE, *RHINICHTHYS CATARACTAE*, AND RIVER CHUB, *NOCOMIS MICROPOGON*, WITH NOTES ON THEIR HYBRIDIZATION. *Copeia* 1980(3):469-478. 6 Sept. 1980. SFA 25(4)
[Ecological Analysts, Inc., York Bldg., 8600 LaSalle Rd., Towson, MD 21204]

80-002537 Desai, A. K. COMPARATIVE STRUCTURAL CHANGES IN THE KIDNEY OF *HILSA ILISHA* AND *HILSA TOLI* AS RELATED TO MIGRATORY HABITS. *J. Anim. Morphol. Physiol.* 26(1/2):220-227. June-Dec. 1979. SFA 25(4)
[Dep. Zool., Fac. Sci., M.S. Univ. Baroda, Baroda, 390 002, India]

80-002538 Desai, A. K. HISTOLOGICAL OBSERVATIONS ON CATECHOLAMINE SECRETING CELLS IN THE HEART OF MIGRATORY *HILSA ILISHA* AND NON-MIGRATORY *HILSHA TOLI*. *J. Anim. Morphol. Physiol.* 26(1/2):252-256. June-Dec. 1979. SFA 25(4)
[Dep. Zool., Fac. Sci., M.S. Univ. Baroda, Baroda-390 002, India]

80-002539 Dunel-Erb, S. and P. Laurent. ULTRASTRUCTURE OF MARINE TELEOST GILL EPITHELIA: SEM AND TEM STUDY OF THE CHLORIDE CELL APICAL MEMBRANE. *J. Morphol.* 165(2):175-186. Aug. 1980. SFA 25(4)
[Lab. Physiol. Comp. Reg., CNRS, B.P. 20 CR, 67037 Strasbourg, France]

80-002540 Ellertsen, B.; P. Solemdal; T. Strømme; S. Tilseth;T. Westgård; E. Moksness and V. Øiestad. SOME BIOLOGICAL ASPECTS OF COD LARVAE (*GADUS MORHUA* L.). *Fiskeridir. Skr. Ser. Havunders.* 17(2):29-47. 1980. SFA 25(4)
[Inst. Mar. Res., Dir. Fish., Bergen, Norway]

80-002541 Eys, G. J. J. M. van. STRUCTURAL CHANGES IN THE PARS INTERMEDIA OF THE CICHLID TELEOST *SAROTHERODON MOSSAMBICUS* AS A RESULT OF BACKGROUND ADAPTATION AND ILLUMINATION. II. THE PAS-POSITIVE CELLS. *Cell Tissue Res.* 210(2):171-179. Aug. 1980. SFA 25(4)
[Dep. Zool., Univ. Nijmegen, Toernooweld 25, The Netherlands]

80-002542 Fives, J. M. AN ACCOUNT OF THE EGGS AND EARLY DEVELOPMENTAL STAGES OF MONTAGU'S BLENNY, *CORYPHOBLENNIUS GALERITA* (L.), WITH NOTES ON THE REPRODUCTIVE BEHAVIOUR OF THE ADULTS. *J. Mar. Biol. Assoc. U.K.* 60(3):749-757. Aug. 1980. SFA 25(4)
[Dep. Zool., University Coll., Galway, U.K.] Montagu's blenny, *Coryphoblennius galerita* was reared to late larval stage under laboratory conditions. The adult male guarded the eggs and aerated them with its tail during the incubation period. The larvae had a small amount of yolk on hatching and although they appeared to be feeding on the variety of food

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80-002542 CONTINUED introduced, no food was observed in the gut. The gas bladder, observable above the gut in all larvae, was filled with gas only in the one specimen, killed at 4.5 min T.L., which survived after the yolk was utilized, and in some 4 mm specimens taken from the plankton off Mweenish. Descriptions are given of the larval stages and of juveniles taken from rock pools.

80-002543 Galis, F. and C. D. N. Barel. COMPARATIVE FUNCTIONAL MORPHOLOGY OF THE GILLS OF AFRICAN LACUSTRINE CICHLIDAE (PISCES, TELEOSTEI). AN ECO-MORPHOLOGICAL APPROACH. *Neth. J. Zool.* 30(2):392-430. June 1980. SFA 25(4)
[Dep. Morphol., Zool. Lab., Univ. Leiden, The Netherlands]

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80-002545 Gorshkov, S. A. A COMPARATIVE MORPHOLOGICAL DESCRIPTION OF THE CHUM SALMON, *ONCORHYNCHUS KETA*, FROM DIFFERENT LOCAL POPULATIONS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):10-23. 1979. SFA 25(4)
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[Dep. Zool., Hindu Coll., Moradabad, U.P., India]

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[Inst. Med. Microbiol., 22 Juliane Maries Vej, DK-2100 Copenhagen Ø, Denmark]

80-002548 Hoffmann, R.; P. Wondrak and W. Groth. SEASONAL ANATOMICAL VARIATIONS IN THE TESTES OF EUROPEAN PIKE, *ESOX LUCIUS* L. *J. Fish Biol.* 16(5):475-482. May 1980. SFA 25(4)
[Anim. Health Serv., Bavaria, D-8011 Grub bei Munchen, West Germany]

80-002549 Hughes, G. M. ULTRASTRUCTURE AND MORPHOMETRY OF THE GILLS OF *LATIMERIA CHALUMNAE*, AND A COMPARISON WITH THE GILLS OF ASSOCIATED FISHES. *Proc. R. Soc. Lond. B Biol. Sci.* 208(1172):309-328. July 1980. SFA 25(4)
[Res. Unit Comp. Anim Respiration, Bristol Univ., Woodland Rd., Bristol BS8 1UG, England]

80-002550 Imada, K. [HISTOLOGICAL OBSERVATION ON THE DEFORMED POND SMELT, *HYPOMESUS OLIDUS*, COLLECTED IN HOKKAIDO. *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 41-55. Dec. 1979. In Japanese with English summ. SFA 25(4)
[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

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[Dep. Zool., Univ. Liverpool, Liverpool L69 3BX, England]

80-002552 Kumari, S. D. R. and N. B. Nair. SEXUAL DIMORPHISM IN THE LOACHES *NEOMACHEILUS TRIANGULARIS* (DAY) AND *LEPIDOCEPHALUS THERMALIS* (CUV. & VAL.). *J. Anim. Morphol. Physiol.* 26(1/2):198-210. June-Dec. 1979. SFA 25(4)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum-7, India]

80-002553 Lange, R. H. LIPOPROTEIN CRYSTALS IN THE YOLK PLATELET OF A TELEOST, *PELVICACHROMIS PULCHER* (CICHLIDAE). *Cell Tissue Res.* 209(3):511-513. Aug. 1980. SFA 25(4)
[Zent. Anat. Cytobiol., Univ. Giessen, Aulweg 123, D-6300 Giessen, West Germany]

80-002554 Laroche, W. A. and S. L. Richardson. DEVELOPMENT AND OCCURRENCE OF LARVAE AND JUVENILES OF THE ROCKFISHES *SEBASTES FLAVIDUS* AND *SEBASTES MELANOPS* (SCORPAENIDAE) OFF OREGON. *NOAA Fish. Bull.* 77(4):901-923. 1980. SFA 25(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Developmental series of larvae and juveniles of two important and very similar species of northeast Pacific rockfishes (Scorpaenidae: *Sebastes*) are described and illustrated: *S. flavidus* (10.1-105.0 mm standard length) and *S. melanops* (10.6-111.6 mm standard length). Descriptions include a literature review, identification, distinguishing features, general development, morphology, fin development, spination, scale formation, pigmentation, and color of fresh specimens. The main differences between *S. flavidus* and *S. melanops* within the size range described are pectoral fin ray number (usually 18 versus 19), lateral line pore number (usually >50 versus <50), and caudal peduncle depth/caudal peduncle length ration (mean values 0.73, 0.64, 0.64, 0.80 versus 0.88, 0.78, 0.74, 0.92 in postflexion larvae, transforming, pelagic juvenile, and benthic juvenile specimens, respectively). Occurrence of these two species in waters off Oregon is discussed. Small benthic juveniles of *S. flavidus* seem to inhabit deeper waters, >20 m depth, than those of *S. melanops*. Comparisons are made among known larvae and juveniles of *Sebastes* species. Identification problems within the *S. flavidus-S. melanops/S. entomelas-S. mystinus* groups are discussed.

80-002555 Leino, R. L. ASPECTS OF THE FINE STRUCTURE, CYTOCHEMISTRY AND DISTRIBUTION OF TELEOST RODLET CELLS. *Ph.D. dissertation, Union Grad. Sch. (Ohio)* 166p. 1979. From Diss. Abstr. Int. B Sci. Eng. 41(2):435. Aug. 1980. SFA 25(4)

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[Inst. Anat. Zool. Lab., Univ. Bergen, Norway]

80-002557 Macy, A. E. GROWTH-RELATED CHANGES IN THE RECEPTIVE FIELDS OF RETINAL GANGLION CELLS IN THE GOLDFISH. *Ph.D. dissertation, Univ. Mich.* 148p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(2):479. Aug. 1980. SFA 25(4)

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[N.C. A&T State Univ., Greensboro] Relatively little is known about the mechanism or significance of melanism which rarely is encountered in some males of some southeastern populations of mosquitofish, *Gambusia affinis holbrooki*. The possible adaptive advantage of sexual selection by means of female choice for rare males was investigated. In an aquarium with compartments designed to physically but not visually isolate subjects, females were given a 1:1 choice between a melanic male and a normal male. Females which had previous experience with melanic males in nature demonstrated cooperative sexual responses to both types of males equally, as did females which had never experienced melanic males in nature. Thus, it is likely that some factor other than sexual selection (e.g., competition for resources other than mates) is responsible for the occurrence of melanism in male mosquitofish.

80-002559 Mosse, P. R. L. VASCULAR ANATOMY OF THE LATERAL MUSCULATURE OF THE FLATHEAD, *PLATYCEPHALUS BASSENSIS* (TELEOSTEI: PERCIFORMES). *Zoomorphologie* 95(2):133-148. June 1980. SFA 25(4)

[Dep. Zool., Univ. Melbourne, Parkville, 3052, Victoria, Australia]

80-002560 Peňáz, M. and J. Gajdůšek. EARLY DEVELOPMENT OF BREAM, *ABRAMIS BRAMA*, FROM THE WATER RESERVOIR MOSTIŠTĚ, CZECHOSLOVAKIA. *Folia Zool.* 28(4):347-360. 1979. SFA 25(4)

[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

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[Zool. Inst., Univ. Salzburg, Akademiestr. 26, A-5020, Salzburg, Austria]

80-002562 Rasmussen, R. P. EGG AND LARVA DEVELOPMENT OF BROOK SILVERSIDES FROM THE PEACE RIVER, FLORIDA. *Trans. Am. Fish. Soc.* 109(4):407-416. July 1980. SFA 25(4)

[Texas Instruments, Inc., P.O. Box 225621, MS 349, Dallas, TX 75268]

80-002563 Rechten, C. A NOTE ON THE REPRODUCTIVE COLOURATION OF THE CICHLID FISH *ETROPLUS MACULATUS*. *J. Comp. Ethol.* 52(2):135-140. 1980. In English with German summ. SFA 25(4)

[Max-Planck-Inst. Verhaltensphysiol., Seewiesen, West Germany]

80-002564 Reif, W.-E. A MECHANISM FOR TOOTH PATTERN REVERSAL IN SHARKS: THE POLARITY SWITCH MODEL. *Wilhelm Roux's Arch. Dev. Biol.* 188(2):115-122. June 1980. SFA 25(4)

[Inst. Geol. Palaontol., University, Sigwartstr. 10, D-7400 Türbingen, West Germany]

80-002565 Reimchen, T. E. SPINE DEFICIENCY AND POLYMORPHISM IN A POPULATION OF *GASTEROSTEUS ACULEATUS*: AN ADAPTATION TO PREDATORS? *Can. J. Zool.* 58(7):1232-1244. July 1980. In English with French summ. SFA 25(4)

[Drizzle Lake Ecol. Reserve, Box 297, Port Clements, Queen Charlotte Islands, BC V0T 1R0, Canada] A population of *Gasterosteus aculeatus* from a muskeg lake on the Queen Charlotte Islands shows a spine polymorphism, with

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80-002565 CONTINUED 80% lacking the second dorsal spine and 68% lacking the pelvic spines. Females were more prevalent among phenotypes with greater spine number, and males were more common among those with fewer spines. Adult females, as well as juveniles of both sexes with pelvic spines, were more frequent in the limnetic habitat, whereas adult males and juveniles without pelvic spines were common in the littoral region. Five species of piscivorous birds, each in low numbers, foraged in the lake. Extensive predation in the limnetic region by *Gavia immer* and, secondarily, *Podiceps* spp. is implicated as a selective pressure favouring the greater spined phenotype. Odonate nymphs (*Aeshna* spp.) consumed juvenile fish in predation experiments and in the lake proper. Nymphs were common in the littoral zone, where submerged debris provided substrate for foraging. It is proposed that spine loss in this population of *G. aculeatus* is an adaptation to the hunting technique of *Aesna*, whereby reduced external structures such as spines minimize frictional contact for a grappling predator. Experimental data and other gasterosteid populations are discussed with reference to these proposals.

80-002566 Riehl, R. GIANT COLLAGEN FIBRES IN THE GONOPODIUM OF THE MOSQUITOFISH *HETERANDRIA FORMOSA* AGASSIZ, 1853 (PISCES, POECILIIDAE). *Experientia (Basel)* 36(8):961-963. 15 Aug. 1980. SFA 25(4)
[Inst. Allg. Spez. Zool., Justus-Liebig Univ., Stephanstr. 24, D-6300 Giessen, West Germany]

80-002567 Sharma, C. L. A BIOMETRICAL STUDY ON RHOMBENCEPHALON AND ITS PARTS IN THE DEVELOPMENTAL STAGES OF *CIRRHINA MRIGALA* (HAM). *J. Anim. Morphol. Physiol.* 26(1/2):102-108. June-Dec. 1979. SFA 25(4)
[Post Grad. Dep. Zool., S.S.L. Jain Coll., Vidisha (M.P.), India]

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80-002569 Shubnikova, N. G. ON SEXUAL DIMORPHISM IN THE SILVER CARP, *HYPOPHTHALMICHTHYS MOLITRIX*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):154-158. 1979. SFA 25(4)
[Dep. Ichthyol., Moscow Univ., USSR]

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[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

80-002571 Smith, D. G. and M. M. Leiby. THE LARVA OF THE CONGRID EEL *ACROMYCTER ALCOCKI* (PISCES: ANGUILLIFORMES), AND THE DISTINCTION BETWEEN CONGRID AND OPHICHTHID LARVAE. *Proc. Biol. Soc. Wash.* 93(2):388-394. 28 Aug. 1980. SFA 25(4)
[Mar. Biomed. Inst., 200 University Blvd., Galveston, TX 77550]

80-002572 Sorokin, V. N. and A. A. Sorokina. MORPHOMETRIC DESCRIPTION OF THE BAIKAL PIKE, *ESOX LUCIUS LUCIUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):143-147. 1979. SFA 25(4)
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[CSIRO, Davies Lab., Private Mail Bag, P.O. Townsville, Queensland 4810, Australia]

80-002574 Theisen, B.; H. Breucker; E. Zeiske and R. Melinkat. STRUCTURE AND DEVELOPMENT OF THE OLFACTORY ORGAN IN THE GARFISH *BELONE BELONE* (L.) (TELEOSTEI, ATHERINIFORMES). *Acta Zool. (Stockh.)* 61(3):161-170. 1980. SFA 25(4)
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80-002575 Val-Sella, M. V. and A. Sesso. THIN SECTION AND FREEZE FRACTURE STUDIES OF THE HYPOPHYSEAL PROXIMAL PARS DISTALIS IN A TELEOST (*RHAMDIA HILARII* VAL.) DURING DIFFERENT STAGES OF THE REPRODUCTIVE CYCLE. *Cell Tissue Res.* 208(3):433-444. June 1980. SFA 25(4)
[Dep. Gen. Physiol., Inst. Biosci., Univ. San Paulo, C. P. 11.461, San Paulo, Brazil]

80-002576 Verigina, I. A. PECULIARITIES OF THE ALIMENTARY CANAL OF THE PREDATORY CYPRINID, *OPSARIICHTHYS UNCIROSTRIS AMURENSIS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):92-97. 1979. SFA 25(4)
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[Gatty Mar. Lab., The University, St. Andrews, Fife, Scotland]

80-002578 Wunder, W. NATÜRLICHE VERKRÜMMUNG (PHYSIOLOGISCHE KYPHOLORDOSE) DER WIRBELSÄULE BEI DER FISCHART BLAUFELCHEN (*COREGONUS WARTMANNI*) IM BODENSEE WÄHREND DER LAICHZEIT. [PHYSIOLOGICAL CURVATURE (KYPHOLORDOSIS) OF THE SPINE ON THE FISH SPECIES BLAUFELCHEN (*COREGONUS WARTMANNI*) IN THE LAKE BODENSEE DURING THE SPAWNING TIME.] *Zool. Anz.* 204(1/2):129-136. 1980. In German with English summ. SFA 25(4)
[Ebrardstrasse 13, D-8520 Erlangen, West Germany]

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[Ebrardstrasse 13, D-8520, Erlangen, West Germany]

80-002580 Yemel'yanova, N. G. ELECTRON-MICROSCOPIC STUDY OF THE EGG MEMBRANES AND OVARIAN FOLLICLE IN THE SILVER CARP, *HYPOPHTHALMICHTHYS MOLITRIX. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):95-105. 1979. SFA 25(4)
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PHYSIOLOGY

80-002581 Boëtius, I. and J. Boëtius. EXPERIMENTAL MATURATION OF

PHYSIOLOGY (CONTINUED)

80-002581 CONTINUED FEMALE SILVER EELS, *ANGUILLA ANGUILLA*. ESTIMATES OF FECUNDITY AND ENERGY RESERVES FOR MIGRATION AND SPAWNING. *Dana* 1:1-28. 1980. SFA 25(4)

[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] Female silver eels at body weights of 0.5 to 1.5 kg were treated with acetone-dried carp pituitaries and other gonadotrophic substances. Experiments were made in sea water at 23°C. The most successful treatment proved to be 15 mg carp pituitary + 500 IU HCG twice a week. This dosage resulted in strip-ripe eels in 40-80 days. Maximum gonado-somatic index: 60.7. Attempts at fertilization succeeded in a few cases, but embryonic development ceased at early stages (gastrula). The estimated fecundity of matured eels ranged from 0.7 to 2.6 million eggs. Ovaries and somatic bodies of matured eels were analysed for contents of water, lipid and protein. Based on the calculated energy reserves a rough estimate of an energy budget for migration and spawning was established.

80-002582 Aida, K.; R. S. Nishioka and H. A. Bern. CHANGES IN THE CORPUSCLES OF STANNIUS OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) DURING SMOLTIFICATION AND SEAWATER ADAPTATION. *Gen. Comp. Endocrinol.* 41(3):296-304. July 1980. SFA 25(4)

[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo, Japan] Two types of cells (type 1 with large granules and type 2 with small granules) are present in the corpuscles of Stannius of the coho salmon, *Oncorhynchus kisutch*, during smoltification. The cells increase in size during normal smoltification and are equally large in freshwater and seawater smolts; in abnormal stunted fish in seawater the mean cell size is similar to that characteristic of parr. Nevertheless, the predominant type 1 cells (as well as the less frequent type 2 cells) in stunts appear active and are relatively depleted of granules. Type 1 cells may be associated with hypocalcin secretion; release of this hormone may be greater in stunts than in normal seawater smolts, possibly owing to initial difficulty of these incompletely smoltified fish to adjust to the seawater environment.

80-002583 Aida, K.; R. S. Nishioka and H. A. Bern. DEGRANULATION OF THE STANNIUS CORPUSCLES OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN RESPONSE TO IONIC CHANGES *IN VITRO*. *Gen. Comp. Endocrinol.* 41(3):305-313. July 1980. SFA 25(4)

[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo, Japan]

80-002584 Ando, M. CHLORIDE-DEPENDENT SODIUM AND WATER TRANSPORT IN THE SEAWATER EEL INTESTINE. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 138(1):87-91. July 1980. SFA 25(4)

[Lab. Physiol., Fac. Integrated Arts Sci., Hiroshima Univ., Higashisenda-machi, Hiroshima 730, Japan]

80-002585 Armstrong, P. B. TIME-LAPSE CINEMICROGRAPHIC STUDIES OF CELL MOTILITY DURING MORPHOGENESIS OF THE EMBRYONIC YOLK SAC OF *FUNDULUS HETEROCLITUS* (PISCES: TELEOSTI). *J. Morphol.* 165(1):13-29. July 1980. SFA 25(4)

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80-002586 Benz, G. W. PROGRESSIVE ONTOGENETIC CHANGES IN THE SOLUBLE NUCLEAR EYE LENS PROTEINS OF THE SANDBAR SHARK, *CHARCHARHINUS MILBERTI (VALENCIENNES)* *Comp. Biochem. Physiol. B. Comp. Biochem.* 67(1):191-193. 1980. SFA 25(4).

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[Dep. Zool. II, Univ. Karlsruhe, Kaiserstr. 12,7500 Karlsruhe, West Germany]

80-002588 Black, E. and G. B. Cline. MARKER ENZYME ACTIVITIES OF CELL COMPONENTS OF GILL TISSUE OF THE STRIPED MULLET (*MUGIL CEPHALUS*) FOLLOWING FRACTIONATION AND PURIFICATION IN SUCROSE DENSITY GRADIENTS. *J. Ala. Acad. Sci.* 51(3):177. July 1980. Abstract only. SFA 25(4)
[Dep. Biol., Univ. Ala., Birmingham 35294]

80-002589 Black, E.; R. L. Shoemaker and G. B. Cline. ION REGULATION BY THE GILL MEMBRANES OF THE STRIPED MULLET (*MUGIL CEPHALUS*) AS MEASURED BY PERFUSION STUDIES. *J. Ala. Acad. Sci.* 51(3):177-178. July 1980. Abstract only. SFA 25(4)
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80-002590 Bols, N. C.; S. A. Boliska; J. B. Rainville and H. E. Kasinsky. NUCLEAR BASIC PROTEIN CHANGES DURING SPERMIOGENESIS IN THE LONGNOSE SKATE AND THE SPINY DOGFISH. *J. Exp. Zool.* 212(3):423-433. June 1980. SFA 25(4)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

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[S.C. Wildl. Mar. Resour. Dep., P.O. Box 170, Bonneau 29431]

80-002592 Bulakov, A. B.; Ye. B. Moiseyeva and A. P. Zolotnitskiy. PHYSIOLOGICAL-BIOCHEMICAL CHARACTERIZATION OF THE PITUITARY GLAND OF THE BLACK SEA TURBOT, *SCOPHTHALMUS MAEOTICUS MAEOTICUS*, IN CONNECTION WITH THE QUESTION OF THE NUMBER OF GONADOTROPINS IN FISH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):111-120. 1979. SFA 25(4)
[Dep. Ichthyol., Moscow Univ., USSR]

80-002593 Burton, D. T. and A. G. Heath. AMBIENT OXYGEN TENSION (P_{O_2}) AND TRANSITION TO ANAEROBIC METABOLISM IN THREE SPECIES OF FRESHWATER FISH. *Can. J. Fish. Aquatic Sci.* 37(8):1216-1224. Aug. 1980. In English with French summ. SFA 25(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Mar. Lab., Benedict, MD 20612]

80-002594 Carillo, M. A.; S. Zanuy; J. Kuo and W. Watanabe. DAILY RHYTHMS OF LIVER cAMP, TOTAL LIVER LIPIDS, PROLACTIN-LIKE HORMONE AND GROWTH HORMONE CELL ACTIVITIES IN *SAROTHERODON MOSSAMBICUS* ACCLIMATED TO DIFFERENT PHOTOPERIOD REGIMES. *Gen. Comp. Endocrinol.* 41(3):325-333. July 1980. SFA 25(4)
[Estacion Invest. Pesq. Torre de la Sal, Ribera de Cabanes, Castellón, Spain]

80-002595 Chikhachev, A. S.; V. A. Boryakin and V. V. Tyan'kin. RESISTANCE OF YOUNG STURGEON HYBRIDS (ACIPENSERIDAE) TO EXTREME CONDITONS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):155-158. 1979. SFA 25(4)
[AZNIIRKh, Rostov-on-Don, USSR]

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[Liver Res. Cent., Albert Einstein Coll. Med., Bronx, NY 10461]

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[Lab. Mar. Biol. Assoc., Citadel Hill, Plymouth, England]

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[Dep. Ecol. Evol., State Univ. N.Y., Stony Brook 11794] Eggs of Atlantic menhaden, *Brevoortia tyrannus*, were artificially fertilized and embryos were reared in the laboratory at 12 temperature-salinity combinations (temperature: 10°, 15°, 20°, and 25° C; salinity: 10, 20, 30 ^{o}/oo). Salinity between 10 and 30 ^{o}/oo had no significant effect on embryonic mortality and no noticeable effect on rate of development. Temperature had a significant effect on embryonic mortality and rate of development. Embryonic mortality was significantly greater at 10°C than at 15°, 20°, and 25°C, and significantly greater before than after blastopore closure at 15°, 20°, and 25°C. The temperature between 10° and 25°C is 3.89. Age of *B. tyrannus* embryos can be estimated by the regression of age on developmental stages when incubated at constant temperature.

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[Sch. Biochem., Univ. New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia]

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[N.E.R.C. Inst. Mar. Biochem., Aberdeen, AB1 3RA, Scotland]

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[Dep. Zool., Harvard Univ., Washington, DC 20059]

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[Dep. Legal Med., Sch. Med., Gunma Univ., Maebashi, Japan]

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[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

80-002617 Heiligenberg, W. THE EVALUATION OF ELECTRORECEPTIVE FEEDBACK IN A GYMNOTOID FISH WITH PULSE-TYPE ELECTRIC ORGAN DISCHARGES. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 138(2):173-185. July 1980. SFA 25(4)
[Neurobiol. Unit, Scripps Inst. Oceanogr., La Jolla, CA 92093]

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[Dep. Zoophysiol., Univ. Göteborg, Sweden]

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[Dep. Zoophysiol., Univ. Göteborg, Sweden]

80-002620 Idler, D. R. and C. M. Campbell. GONADOTROPIN STIMULATION OF ESTROGEN AND YOLK PRECURSOR SYNTHESIS IN JUVENILE RAINBOW TROUT. *Gen. Comp. Endocrinol.* 41(3):384-391. July 1980. SFA 25(4)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

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[Nansei Reg. Fish. Res. Lab., Naruishi, Ohno-cho, Saeki-gun, Hiroshima 739-04, Japan]

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[Dep. Zool. Entomol, Colo. State Univ., Fort Collins 80523] White suckers select a higher body temperature at night and a lower temperature during daytime. Removal of the pineal organ eliminated their diel rhythm of behavioral thermoregulation. After pinealectomy fish failed to select a lower daytime temperature. These results suggest that the pineal organ is involved in the control of behavioral thermoregulation of this teleost fish.

80-002623 Kawauchi, H.; K. Abe and A. Takahashi. CORTICOTROPIN LIKE INTERMEDIATE LOBE PEPTIDE IN THE SALMON PITUITARY. *Bull. Jpn. Soc. Sci. Fish.* 46(6):743-747. June 1980. SFA 25(4)
[Sch. Fish. Sci., Kitasato Univ., Sanriku-cho, Kesen-gun, Iwate 022-01, Japan]

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[Dep. Physiol. Biophys., Univ. Ill., Urbana 61801]

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[Dep. Zool., The University, Sheffield, S10 2TN, England]

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[Dep. Anat. Neurobiol., Univ. Vt., Coll. Med., Burlington 05404]

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[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum-695007, Kerala, India]

80-002629 Kumari, S. D. R. and N. B. Nair. EFFECTS OF FEEDING RATE ON THE GROWTH, CONVERSION EFFICIENCY AND CHEMICAL COMPOSITION OF *NOEMACHEILUS TRIANGULARIS* (DAY) AND *LEPIDOCEPHALUS THERMALIS* (CUV. & VAL). *J. Anim. Morphol. Physiol.* 26(1/2):296-306. June-Dec. 1979. SFA 25(4)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum-7, India]

80-002630 Kutty, M. N.; N. Sukumaran and H. M. Kasim. INFLUENCE OF TEMPERATURE AND SALINITY ON SURVIVAL OF THE FRESHWATER MULLET, *RHINOMUGIL CORSULA* (HAMILTON). *Aquaculture* 20(3):261-274. July 1980. SFA 25(4)

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80-002630 CONTINUED
[Fish. Coll., Tamil Nadu Agric. Univ., Tuticorin 628003, India] The upper incipient lethal temperatures of the freshwater mullet, *Rhinomugil corsula*, acclimated to 15, 20, 25, 30 and 35°C in fresh water, were 32.4, 34.1, 36.0, 36.2 and 36.5°C respectively, and the corresponding lower lethal temperatures were 10.5, 11.5, 13.2, 15.8 and 19.5°C. The mullet has a total tolerance (area of thermal polygon) of 569°C^2 with an upper and lower thermal tolerance of 253 and 316°C. Likewise, the total resistance of the mullet was 391°C^2, with upper and lower resistance zones of 181 and 210°C respectively. The upper critical temperatures of swimming inhibition of *R. corsula* (17.2 cm; acclimation 30°C), determined in a swimming tunnel, were 35.2, 34.6 and 34.2 for water current velocities of 38, 62 and 77 cm/s respectively. The corresponding lower critical temperatures were 26.2, 27.5 and 28.1°C. These results indicated the stenothermal nature of the mullet by comparison with other fishes, e.g. *Tilapia mossambica*. In tests on the influence of ambient salinity on thermal resistance, *R. corsula* survived longest at 7^o/oo (iso-osmotic salinity). At salinities above and below this point, survival times were shorter at any lethal temperature. In a tentative scheme for quantification of stress due to temperature and salinity at death (after acclimation to 30°C and tested at 37°C), the hypo-osmotic and hyper-osmotic stress were estimated to be 50 and 31% of the thermal stress (100%) respectively.

80-002631 Kuz'mina, V. V. THE LEVEL OF α-AMYLASE ACTIVITY IN THE BLOOD OF FRESH WATER TELEOSTS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):123-131. 1979. SFA 25(4)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok Yaroslavl Reg., USSR]

80-002632 Lapin, V. I. and V. Ye. Matsuk. UTILIZATION OF YOLK AND CHANGE IN THE BIOCHEMICAL COMPOSITION OF THE EGGS OF THE NAVAGA, *ELEGINUS NAVAGA*, DURING EMBRYONIC DEVELOPMENT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):131-136. 1979. SFA 25(4)
[Dep. Ichthyol., Moscow Univ., USSR] The dynamics of the biochemical composition of the eggs of the navaga, *Eleginus navaga*, during embryonic development were studied. Considerable changes in the composition of the eggs during swelling after fertilization are connected mainly with the reorganization of substances stored in the yolk in order to adjust the osmotic pressure in the egg to environmental pressure. Total energy expediture during embryonic development constitutes approximately one-seventh of the substances contained in the oocyte.

80-002633 Lapina, N. N. and V. D. Spanovskaya. SEASONAL DYNAMICS OF THE BIOCHEMICAL COMPOSITION OF SOME ORGANS AND TISSUES OF THE WHITE BREAM, *BLICCA BJOERKNA*, FROM MOZHAYSK RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):121-129. 1979. SFA 25(4)
[Dep. Ichthyol., Moscow Univ., USSR]

80-002634 Leatherland, J. F. and R. A. Sonstegard. SEASONAL CHANGES IN THYROID HYPERPLASIA, SERUM THYROID HORMONE AND LIPID CONCENTRATIONS, AND PITUITARY GLAND STRUCTURE IN LAKE ONTARIO COHO SALMON, *ONCORHYNCHUS KISUTCH* WALBAUM AND A COMPARISON WITH COHO SALMON FROM LAKES MICHIGAN AND ERIE. *J. Fish Biol.* 16(5):539-562. May 1980. SFA 25(4)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON, Canada] A progressive fall in serum thyroid hormone levels was found in Lake Ontario coho salmon, *Oncorhynchus kisutch*, between May 1978 and January 1979 concomitant with an increase in goitre frequency and thyroid hyperplasia. Despite marked differences in overt goitre frequency in sexually mature adult salmon collected from lakes Ontario (43.7%), Erie (93.5%), or Michigan (0%), serum thyroid hormone levels and thyroid histology were similar in fish from

PHYSIOLOGY (CONTINUED)

80-002634 CONTINUED the three lakes. Two gonadotrop-like basophil cells ('globular' and 'vacuolar') were found in the pituitary, particularly in sexually maturing and mature adults and 'jacks'. Whereas in salmon from Lakes Ontario or Michigan, the globular cells were vacuolated in Lake Erie salmon they were not; this observation may be correlated with the absence of obvious secondary sexual characteristics in Lake Erie salmon. Serum free fatty acids serum, triglycerides and cholesterol concentrations in Lake Ontario salmon fell progressively from the condition in fish collected from the Lake in May 1978, to that of fish collected during their potamodrous migration in November 1978 and January 1979.

80-002635 Lesel, R. and M. Lesel. OBTENTION D'ALEVINS NON VÉSICULÉS AXÉNIQUES DE SALMONIDES. [OBTENTION OF GNOTOBIOTIC SALMONID FISH FRY.] *Ann. Hydrobiol.* 7(1):21-25. 1976. In French with English summ. SFA 25(4)
[Lab. Microorgan., Cent. Rech. Hydrobiol., I.N.R.A., B.P. 79, 64200 Biarritz, France] An easy method by disinfection of eyed eggs has been worked out in order to obtain gnotobiotic Salmonid fish fry. After checking the absence of bacteria, eggs are put in a plastic isolator, Trexler type, into a germfree water aquarium. The rearing method utilized has enabled a fry survival of 15 days after yolk sac resorption.

80-002636 Lizenko, Ye. I.; V. S. Sidorov, Z. A. Nefyodova and O. I. Potapova. THE CONTENT OF LIPID COMPONENTS IN THE EGG AND MILT OF THE CISCO, *COREGONUS ALBULA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):158-161. 1979. SFA 25(4)
[Inst. Biol., Karelian Br., USSR Acad. Sci., Petrozavodsk, USSR]

80-002637 Locket, N. A. SOME ADVANCES IN COELACANTH BIOLOGY. *Proc. R. Soc. Lond. B Biol. Sci.* 208(1172):265-307. 17 July 1980. SFA 25(4)
[Dep. Anat., Univ. Adelaide, Box 498, G.P.O., Adelaide, 5001, Australia]

80-002638 Logan, W. T., Jr. TROUT HEALTH DETERMINATION THROUGH BLOOD INDICES AND HISTOLOGY. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:10-23. 1980. Available @$5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[904 Pioneer Ave., Fort Collins, CO 80521] Rainbow trout (*Salmo gairdneri*) health was evaluated in a two part study by hematology, blood chemistry and histology. Phase I of the study was designed to establish the ranges of various blood and tissue parameters compatible with normal health, utilizing two nutritionally complete and balanced ration regimes. Phase II of the study involved comparison of the parameters representing normal health with data obtained from four groups of trout at two Colorado Division of Wildlife trout culture facilities. The research has revealed that biologically significant differences in blood values should not occur in trout fed nutritionally complete and balanced rations. Variations in blood indices occur due to temperature, seasonal and sexual maturation changes. Physical damage, stress and states of disease can be detected by measurement of blood indices and histological examination. Observation of trout blood and tissue indices can be a useful procedure in management of trout cultural facilities. Timely analysis of blood and tissues may reveal nutritional deficiencies, disease and tissue damage in a population and allow essential information for the economic management.

80-002639 Lopez-Vidriero, M. T.; R. Jones; L. Reid and T. C. Fletcher. ANALYSIS OF SKIN MUCUS OF PLAICE *PLEURONECTES PLATESSA* L. *J. Comp. Pathol.* 90(3):415-420. July 1980. SFA 25(4)
[Children's Hosp. Med. Cent. 300, Longwood Ave., Boston, MA 02115]

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80-002640 MacFarlane, R. B. EFFECTS OF LOW pH WATER ON THE ADENINE NUCLEOTIDE POOL AND LOCOMOTOR ACTIVITY OF THE GULF KILLIFISH, *FUNDULUS GRANDIS*. *Ph.D. dissertation, Fla. State Univ.* 127p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):874. Sept. 1980. SFA 25(4)

The results of these studies suggest that environmental pH levels below 6.5 may critically impair energy metabolism and behavioral functions of fishes.--From abstr.

80-002641 Malvin, R. L.; D. Schiff and S. Eiger. ANGIOTENSIN AND DRINKING RATES IN THE EURYHALINE KILLIFISH. *Am. J. Physiol.* 239(1):R31-R34. July 1980. SFA 25(4)

[Dep. Physiol., Univ. Mich. Med. Sch., Ann Arbor 48109] Drinking rates were measured in the euryhaline fish *Fundulus heterclitus* in the presence and absence of angiotensin II or its competitive inhibitor P-113 and converting enzyme inhibitor (SQ20881). Angiotensin stimulated drinking in *Fundulus* adapted to salt- or freshwater. More significanly, P-113 decreased drinking rates in saltwater-adapted fish and to ones acutely exposed to saltwater. SQ20881 was also effective in inhibiting drinking. These data are interpreted to support the hypothesis that endogenously produced angiotensin is a physiological stimulus for drinking in fish.

80-002642 Mankura, M.; D. Dalimunthe and M. Kayama. COMPARATIVE BIOCHEMICAL STUDIES ON PLASMA CHOLESTEROL--II. RELATIONSHIP BETWEEN PLASMA ESTERIFIED CHOLESTEROL AND LECITHIN: CHOLESTEROL ACYLTRANSFERASE ACTIVITY. *Bull. Jpn. Soc. Sci. Fish.* 46(5):583-586. May 1980. SFA 25(4)

[Lab. Mar. Biochem., Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan]

80-002643 Matsuno, T.; S. Nagata; M. Katsuyama; H. Matsutaka; T. Maoka and T. Akita. [COMPARATIVE BIOCHEMICAL STUDIES OF CAROTENOIDS IN FISHES--XVIII. CAROTENOIDS OF CULTURED FISHES, JAPANESE CHAR, BROOK TROUT, LAKE TROUT, MASU TROUT, RED-SPOTTED MASU TROUT, RAINBOW TROUT AND BROWN TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):473-478. Apr. 1980. In Japanese with English summ. SFA 25(4)

[Kyoto Coll. Pharm., Misasagi, Yamashina-ku, Kyoto 607, Japan]

80-002644 Mattison, A. and B. Holstein. THE ULTRASTRUCTURE OF THE GASTRIC GLANDS AND ITS RELATION TO INDUCED SECRETORY ACTIVITY OF COD, *GADUS MORHUA* (DAY). *Acta Physiol. Scand.* 109(1):51-59. May 1980. SFA 25(4)

[Dep. Zoophysiol., Univ. Göteborg, Sweden]

80-002645 McGurk, M. D.; J. M. Green; W. D. McKone and K. Spencer. CONDITION INDICES, ENERGY DENSITY AND WATER AND LIPID CONTENT OF ATLANTIC HERRING (*CLUPEA HARENGUS HARENGUS*) OF SOUTHEASTERN NEWFOUNDLAND. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 958. iv + 41p. Aug. 1980. In English with French summ. SFA 25(4)

[Dep. Biol., Memorial Univ. Newfoundland, St. John's, NF A1B 3X9, Canada]

80-002646 Mearow, K. M. and A. H. Houston. TEMPERATURE-RELATED CHANGES IN THE CONTENT AND DISTRIBUTION OF WATER IN THE TISSUES OF RAINBOW TROUT, *SALMO GAIRDNERI*. *Comp. Biochem. Physiol. A Comp. Physiol.* 67(1):117-121. 1980. SFA 25(4)

[Dep. Biol. Sci., Brock Univ., St. Catherines, ON L2S 3A1, Canada] Water content and distribution were examined at three epaxial muscle sites and in cardiac muscle, gut, spleen, liver and brain of summer and fall-winter populations of rainbow trout acclimated to 2°, 10° and 18°C on a seasonally "neutral" photoperiod regime (12L:12D). Tissue water content tended to be conservative in terms of temperature, but seasonally variable. Tissue water distribution was more influenced by temperature. Increases in extracellular phase volume were commonly encountered at higher temperatures, and were

PHYSIOLOGY (CONTINUED)

80-002646 CONTINUED ordinarily accompanied by reduction in cellular phase volume. It is suggested that adjustments in phase volume may stem from alterations in osmotically-active organic solutes rather than inorganic electrolytes.

80-002647 Mezhnin, F. I. STANNIUS CORPUSCLES IN FISH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):105-123. 1979. SFA 25(4)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR]

80-002648 Milne, R. S. STUDIES ON THE THYROID PHYSIOLOGY OF TWO SALMONID FISHES, *SALMO GAIRDNERI* AND *ONCORHYNCHUS KISUTCH*. *Ph.D. dissertation, Univ. Guelph (Canada)* 1979. From Diss. Abstr. Int. B Sci. Eng. 41(1):99. July 1980. SFA 25(4)

80-002649 Muramatsu, T.; S. Iwanaga and S. Kan. ISOLATION AND CHARACTERIZATION OF GLUTATHIONE REDUCTASE FROM THE DARK MUSCLE OF PACIFIC MACKEREL. *Bull. Jpn. Soc. Sci. Fish.* 46(6):757-762. June 1980. SFA 25(4)
[Lab. Fish. Chem., Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

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[Setchenov Inst. Evol. Physiol. Biochem., Acad. Sci. USSR, 194223 Leningrad, USSR] Experimental data obtained on cyclostomes and fish concerning the levels of plasma fatty acids (PFA), their biological role as an energetic substrate, various factors affecting PFA and mechanisms involved

PHYSIOLOGY (CONTINUED)

80-002662 CONTINUED in the control of their level are reviewed. It was shown that PFA levels in lamprey and fish depend strongly on season, circadian rhythm, nutritional state, age, sex, intrinsic activity of individuals and are regulated by some metabolites as well as hormones. The question concerning the nervous control of PFA in cyclostomes and fish needs further elucidation on account of scarce information available at present.

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[S. D. Hillyard: Desert Biol. Res. Cent., Dep. Biol. Sci., Univ. Nev., Las Vegas 89154] Pupfish (*Cyprinodon salinus*) were acclimated to salinities equivalent to fresh-water, ½ seawater, seawater and 1½ sea-water at each of three temperatures; 15°, 25° and 30°C. The specific activity of of Na$^+$-K$^+$ ATPase in gill homogenates from these animals was lowest in ½ SW at each temperature and rose significantly in fresh-water- and sea-water-acclimated fish. The specific activity of Na$^+$-K$^+$ ATPase in both the fresh-water and sea-water-acclimated fish increased significantly with decreasing acclimation temperature.

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[Salt Marsh Ecol., Fla. A & M Univ. Tallahassee 32307] Oxygen consumption per unit body weight of the migratory species, *Leiostomus xanthurus* and *Lagodon rhomboides*, was greater than that of

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80-002676 CONTINUED cyprinodontid and poecilid killifish species, which are permanent residents in tidal marshes. This is considered to be an inherent characteristic of the species. The routine oxygen consuption of all the species showed a conformity to changes in external oxygen tension in the range of 10-85 mmHg. While killifish showed greater dependence on ambient oxygen, the migratory species showed a lesser degree of conformity.

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GENETICS, VARIATION STUDIES AND HYBRIDIZATION

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[Kazakh' Fish. Res. Inst., Alma-Uta, USSR] The treatment of mature spermatozoa of the carp with a combination of chemical mutagens NEU + DES in concentrations of 0.01, 0.005 and 0.0025% does not lead to a decrease in the fertilizing capacity of spermatozoa. With combined action on the spermatozoa the variability of breeding characters of the carp may be doubled, and consequently the method may be used in breeding research with pond fishes. It is essential to conduct further research on such combinations of mutagens as are capable of increasing the effectiveness of mutagenic effects on fish compared with that of individual mutagens.--Concl.

80-002706 Severin, S. O. THE KARYOTYPE OF THE EUROPEAN GRAYLING, *THYMALLUS THYMALLUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):44-48. 1979. SFA 25(4)
[Perm Univ., USSR] The morphology of the chromosomes of the European grayling, *Thymallus thymallus*, from the Ural region is examined. The diploid number of chromosomes is 102; of these 68 are metacentric and submetacentric and 34 acrocentric, the number of arms of the karyotype is 170. Slight variability is noted in the number of chromosomes (from 100 to 104), which is explained by errors in the preparatory technique used for specimens and possible natural aneuploidy in the cells of the pronephros. 20% of the metaphases investigated had 2n = 104 with a constant number of 170 arms. Chromosomal polymorphism in centric divisions is not excluded, although such an assumption needs to be verified on more extensive material.

80-002707 Shapiro, D. Y. SERIAL FEMALE SEX CHANGES AFTER SIMULTANEOUS REMOVAL OF MALES FROM SOCIAL GROUPS OF CORAL REEF FISH. *Science* 209(4461):1136-1137. 5 Sept. 1980. SFA 25(4)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708] The simultaneous removal of three to nine males from large social groups of *Anthias squamipinnis* led to close to a one-to-one replacement of the removed males be sex-reversing females. The females changed sex serially within each group with a mean interval between successive onset times of 1.9 days. The timing of sex change is thus not independent for each fish but is influenced by the events surrounding other sex reversals within the group.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

80-002708 Shubin, P. N. ELECTROPHORETIC STUDIES OF HEMOGLOBIN AND PROTEIN IN THE BLOOD SERUM OF THE EUROPEAN GRAYLING, *THYMALLUS THYMALLUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):161-164. 1979. SFA 25(4)
[Inst. Biol., Komi Br., USSR Acad. Sci., Syktyvkar, USSR]

80-002709 Taniguchi, N. and Y. Okada. [GENETIC STUDY ON THE BIOCHEMICAL POLYMORPHISM IN RED BREAM.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):437-443. Apr. 1980. SFA 25(4)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

80-002710 Tave, D. and R. O. Smitherman. PREDICTED RESPONSE TO SELECTION FOR EARLY GROWTH IN *TILAPIA NILOTICA*. *Trans. Am. Fish. Soc.* 109(4):439-445. July 1980. SFA 25(4)
[R. O. Smitherman: Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830]

80-002711 Turner, B. J.; R. R. Miller and E. M. Rasch. SIGNIFICANT DIFFERENTIAL GENE DUPLICATION WITHOUT ANCESTRAL TETRAPLOIDY IN A GENUS OF MEXICAN FISH. *Experimentia (Basel)* 36(8):927-930. 15 Aug. 1980. SFA 25(4)
[Dep. Biol., VPI&SU, Blacksburg, VA 24061]

BEHAVIOR

80-002712 Chauvin-Muckensturm, B. and Y. Grelet-Puterflam. SUR L'IMPORTANCE DU CONTEXTE DANS L'INTERPRETATION DES SIGNAUX CHEZ LES MÂLES DE L'ÉPINOCHE (*GASTEROSTEUS ACULEATUS*). [IMPORTANCE OF CONTEXT IN SIGNAL INTERPRETATION IN THREE SPINED STICKLEBACK MALES.] *C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.* 290(19):1273-1275. 19 May 1980. In French with English summ. SFA 25(4)
[Lab. Sociol. Anim., Univ. R.-Descartes, Chateau d'Ivoy-le-Pré, 18380 La Chapelle-d', Angillon, France]

80-002713 Crapon de Caprona, M.-D. OLFACTORY COMMUNICATION IN A CICHLID FISH, *HAPLOCHROMIS BURTONI*. *J. Comp. Ethol.* 52(2):113-134. 1980. In English with Germany summ. SFA 25(4)
[Max-Planck-Inst. Verhaltensphysiol., Seewiesen, West Germany] The responses of adult male *Haplochromis burtoni* to chemical stimuli produced by conspecifics in a reproductive state are tested. The different chemical substances presented to the test fish are described in terms of their short and long-term effects on particular behavior patterns. The responses of intact, anosmic and sham-operated fish are compared to determine whether these substances are perceived though olfaction (as opposed to gustation). Some aspects of the relative importance of visual and chemical cues from gravid females on the reproductive behavior of conspecific male *Haplochromis burtoni* are analysed.

80-002714 DiMichele, L. V. THE HATCHING MECHANISM OF *FUNDULUS HETEROCLITUS*. *Ph.D. dissertation, Univ. Del.* 136p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(1):86. July 1980. SFA 25(4)

80-002715 Ejike, C. and C. B. Schreck. STRESS AND SOCIAL HIERARCHY RANK IN COHO SALMON. *Trans. Am. Fish. Soc.* 109(4):423-426. July 1980. SFA 25(4)
[Dep. Zool., Univ. Jos, Private Mail Bag 2084, Jos, Plateau State, Nigeria]

BEHAVIOR (CONTINUED)

80-002716 Hubert, W. A. and R. T. Lackey. HABITAT OF ADULT SMALLMOUTH BASS IN A TENNESSEE RIVER RESERVOIR. *Trans. Am. Fish. Soc.* 109(4):364-370. July. 1980. SFA 25(4)
[U.S. FWS, Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011]

80-002717 Imabayashi, H. [SETTLING MECHANISM OF LARVAE OF BASTARD HALIBUT, *PARALICHTHYS OLIVACEUS*, IN THE NURSERY GROUND, ESTIMATED FROM THE SIZE DISTRIBUTION.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):419-426. Apr. 1980. In Japanese with English summ. SFA 25(4)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan] This study was carried out to estimate the dates of settlement of larvae of the bastard halibut and to guess the mechanism how they settles on the bottom of their nursery ground in the Genkai-Nada, the Japan Sea. Four size-groups of the bastard halibut were recognized during the growing period (May to September) after their settlement, based on the shift of modes of the length in their growth curves. The dates of their settlement were estimated to be 9th and 24th of April and 7th and 22nd of May by applying Bertalanffy's growth equation to the present data. These four dates of their settlement were endorsed by field surveys of settled youngs of the bastard halibut, and almost coincide with the four spring tides during the period.

80-002718 Kaku, T.; M. Tsumagari; S. Kiyohara and S. Yamashita. GUSTATORY RESPONSES IN THE MINNOW, *PSEUDORASBORA PARVA*. *Physiol. Behav.* 25(1):99-105. July 1980. SFA 25(4)
[S. Yamashita: Biol. Inst., Coll. Liberal Arts, Kagoshima Univ., Kagoshima 890, Japan]

80-002719 Kavaliers, M. CIRCADIAN ACTIVITY OF THE WHITE SUCKER, *CATOSTOMUS COMMERSONI*: COMPARISON OF INDIVIDUAL AND SHOALING FISH. *Can. J. Zool.* 58(8):1399-1403. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] Individual and shoaling white suckers, *Catostomus commersoni*, displayed free running circadian rhythms of locomotor activity under conditions of constant darkness and temperature. The circadian activity of shoals was different from that of single fish. The activity of single fish was rhythmic initially with a period of less than 24 h, but became arrhythmic after 15-30 days. Shoals of white suckers had a less variable circadian period that was greater than 24 h, and showed no evidence of arrhythmicity. The circadian activity of shoals is determined by its behavioural and social organization; it is not simply a more precise version of the activity of single fish.

80-002720 Kavaliers, M. CIRCADIAN RHYTHM IN THE EFFECT OF THEOPHYLLINE ON THE BEHAVIORAL THERMOREGULATION OF THE WHITE SUCKER, *CATOSTOMUS COMMERSONI*. *Pharmacol. Biochem. Behav.* 12(6):843-845. June 1980. SFA 25(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] The temperatures selected by white suckers placed in a thermal gradient were significantly altered by interperitoneal injections of theophylline (25 mg/kg). There was a circadian variation in the effect of theophylline on temperatures selected by individual fish held under constant illumination. Depending on injection time, there was either a significant increase or significant decrease in the temperatures selected. These results are considered in relation to the possible physiological and biochemical effects of theophylline on thermoregulation and circadian rhythms.

80-002721 Konstantinova, N. G.; I. D. Nikol'skii and L. S. Termen. ACOUSTIC AND ELECTRIC ACTIVITY OF *TILAPIA MOSSAMBICA* (CICHLIDAE, PISCES). *Moscow Univ. Biol. Sci. Bull.* 34(2):32-36. 1979. SFA 25(4)
[Moscow Univ., Moscow, USSR]

BEHAVIOR (CONTINUED)

80-002722 Marliave, J. B. SURVIVAL THROUGH METAMORPHOSIS OF PACIFIC HERRING PREVENTED FROM SCHOOLING. *Trans. Am. Fish. Soc.* 109(3):327-328. May 1980. SFA 25(4)
[Vancouver Public Aquarium, P.O. Box 3232, Vancouver, BC V6B 3X8, Canada]

80-002723 McElman, J. F. and E. K. Balon. EARLY ONTOGENY OF WHITE SUCKER, *CATOSTOMUS COMMERSONI*, WITH STEPS OF SALTATORY DEVELOPMENT. *Environ. Biol. Fishes* 5(3):191-224. 29 Sept. 1980. SFA 25(4)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Frequent and detailed observatoins of arbitrary stages revealed a saltatory pattern of development in the early ontogeny of fluvial spawning white sucker. Considered as adaptations for respiration were: i) expansion of the surface area of the yolk through a change in yolk shape, ii) the presence of carotenoid pigment in the yolk, iii) a large caudal vein sinus, iv) coverage of the yolk surface with capillaries of bilaterally paired vitelline plexi, and v) a large pair of vitelline veins. The ability to swim developed slowly and well after hatching. Young suckers would therefore spend most of the eleutheroembryonic phase in the interstices of the rock substrate of the spawning ground. The change from a benthic to pelagic mode of existence occurred with swimbladder inflation and before the start of exogenous feeding.

80-002724 Mochek, A. D. [BEHAVIOUR OF FISHES IN THE COASTAL ZONE OF THE BLACK SEA.] *Zool. Zh.* 59(7):1060-1066. July 1980. In Russian with English summ. SFA 25(4)
[Inst. Anim. Evol. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

80-002725 Nashimoto, K. [THE SWIMMING SPEED OF FISH IN RELATION TO FREQUENCY OF TAIL BEATING AND BODY TYPE.] *Bull. Jpn. Soc. Sci. Fish.* 46(6):675-679. June 1980. In Japanese with English summ. SFA 25(4)
[Fac. Fish., Hokkaido Univ., Minato-Cho, Hakodate 041, Japan]

80-002726 Radakov, D. V.; A. D. Mochek; Yu. N. Sbikin and A. S. Lee. THE INTERRELATIONSHIP BETWEEN GROUP BEHAVIOR AND OTHER BIOLOGICAL CHARACTERISTICS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):167-171. 1979. SFA 25(4)
[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR]

80-002727 Reynolds, W. W. and M. E. Casterlin. THERMOREGULATORY BEHAVIOR OF A TROPICAL REEF FISH, *ZEBRASOMA FLAVESCENS*. *Oikos* 34(3):356-358. May 1980. In English with Russian summ. SFA 25(4)
Ten Hawaiian "Laipala" surgeonfish (Acanthuridae), *Zebrasoma flavescens* (Bennett), were tested individually in electronic "Ichthyotron" shuttleboxes for ability to thermoregulate behaviorally. The fish exhibited a diel rhythm of preferred temperature, with a minimum of 19°C at midnight and a maximum of 23°C at noon. The 24-h mean final thermal preferendum was 21°C, similar to the final preferenda of temperate "cool-water" fishes. The similar thermoregulatory behavior of tropical marine and temperate freshwater fishes suggests that thermoregulatory ability is phylogenetically conservative and not strongly influenced by thermal stability of the environment.

80-002728 Ribbink, A. J.; A. C. Marsh; B. Marsh and B. J. Sharp. PARENTAL BEHAVIOUR AND MIXED BROODS AMONG CICHLID FISH OF LAKE MALAWI. *S. Afr. J. Zool.* 15(1):1-6. 1980. In English with Afrikaans summ. SFA 25(4)

BEHAVIOR (CONTINUED)

80-002728 CONTINUED
[JLB Smith Inst. Ichthyol., Rhodes Univ., Grahamstown, South Africa] The number of species of cichlid found to host foreign offspring in mixed broods in Lake Malawi is much greater than originally supposed. It is suggested that all species which show well developed parental behaviour may have foreign fry mix with their broods on occasion. A variety of species of fry were found in mixed broods. These come from two categories of fish: those which apparently do not guard their free swimming fry, and those which have a well entrenched phase of protective care. Although substrate spawners may encourage other fry to join their broods it is argued that foreign young are unwelcome guests of mouthbrooders.

80-002729 Stevens, J. K. and K. E. Parsons. A FISH WITH DOUBLE VISION. *Nat. Hist.* 89(1):62-67. Jan. 1980. SFA 25(4)
[Playfair Neurosci. Lab., Univ. Toronto, Canada]

80-002730 Trump, C. L. and W. C. Leggett. OPTIMUM SWIMMING SPEEDS IN FISH: THE PROBLEM OF CURRENTS. *Can. J. Fish. Aquatic Sci.* 37(7):1086-1092. July 1980. SFA 25(4)
[Appl. Hydrodynamics Lab., Code 4310, Naval Res. Lab., Washington, DC 20375]

80-002731 Tsvetkov, V. I. and A. N. Danilov. REACTIONS OF THE ROACH, *RUTILUS RUTILUS*, THE MINNOW, *PHOXINUS PHOXINUS*, AND THE "VERKHOVKA", *LEUCASPIUS DELINEATUS*, TO CHANGES IN THEIR BUOYANCY. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):136-141. 1979. SFA 25(4)
[A.N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR] The buoyancy of cyprinid fishes is variable; it may be neutral, negative or positive. With negative buoyancy, the fish swallow air from the surface of the water and fill their gas bladder to the necessary volume (compression). With positive buoyancy, excess gas is discharged from the bladder through the mouth in the form of individual bubbles (decompression). Recording of the latent period of these hydrostatic reactions, their duration and intensity showed the dependence of their manifestation on a number of factors. Under experimental conditions decompression is manifested more rapidly and is more intensive in fish than compression. Species differences in the manifestation of hydrostatic reactions are indistinctly expressed in the minnow, *Phoxinus phoxinus*, the roach, *Rutilus rutilus*, and the "verkhovka", *Leucaspius delineatus*.

80-002732 Webb, P. W. and G. R. Smith. FUNCTION OF THE CAUDAL FIN IN EARLY FISHES. *Copeia* 1980(3):559-562. 6 Sept. 1980. SFA 25(4)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

80-002733 Webb, P. W. and J. M. Skadsen. STRIKE TACTICS OF *ESOX*. *Can. J. Zool.* 58(8):1462-1469. Aug. 1980. In English with French summ. SFA 25(4)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Strike tactics of a lunging piscivore attacking solitary prey were observed in an arena 50 cm long, 50 cm wide, and 10 cm deep and recorded on television video tape. The predators were cultured tiger musky (*Esox* sp.). The prey were fathead minnow (*Pimephales promelas*). Predator strikes were S type fast starts allowing multidirectional attacks. Two strike patterns were observed. Pattern A strikes commenced from a stretched-straight body posture and progressed from fast start stage 1 through the normal three-stage sequence. Pattern B strikes deleted the less efficient first stage, starting acceleration from an S posture. Strikes were directed in the vicinity of the center of mass of the prey, the point that moves least during escape attempts. Prey were usually attacked from the side, minimizing the displacement of the prey from the strike path after an escape attempt. Pattern A strikes were launched over

BEHAVIOR (CONTINUED)

80-002733 CONTINUED distances from 3.8 to 33.9 cm and took 50-300 ms. Catch success was 42%. Pattern B strikes were used for short distances from 1.7 to 7.7 cm, taking 17-100 ms and were 95% successful. The observed strike tactics were those expected to maximize the probability of catching elusive fish prey.

80-002734 Weihs, D. RESPIRATION AND DEPTH CONTROL AS POSSIBLE REASONS FOR SWIMMING OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, YOLK-SAC LARVAE. *NOAA Fish. Bull.* 78(1):109-117. 1980. SFA 25(4)

[Dep. Aeronaut. Eng., Technion, Haifa, Israel] Larval nothern anchovy in the yolk-sac (nonfeeding) stage exhibit regular bursts of continuous swimming during the first 3 days after hatching. It has been suggested that this behavior may have a respiratory function. A different possibility is depth control, countering the tendency of the larvae to sink when motionless. This paper includes a theoretical and experimental investigation of the possible functions of these swimming bouts. The theoretical approach was to define a model and calculate the oxygen available to the larvae when resting and while moving, and experiments were performed as a check of the theoretical results. The experiments were conducted on yolk-sac larvae in sealed tanks with varying dissolved oxygen concentrations to determine the effects of reducing the available oxygen on the frequency and duration of the swimming bursts. Results of the experiments confirmed the theoretical model. They indicate that the swimming bouts both help the larva stay at a constant depth and have a respiratory function when the oxygen concentration in seawater is less than 60% of saturation.

LIFE HISTORY-GENERAL WORKS

80-002735 Balon, E. K., (ed.) CHARRS: SALMONID FISHES OF THE GENUS *SALVELINUS*. *Perspect. Vert. Sci. (Dr. W. Junk bv Publ.)* 1:1-928. Apr. 1980. Available @ $210.60 from Kluwer Boston, Inc., 160 Old Derby St., Hingham, MA 02043. SFA 25(4)

This work is an anthology of reviews and original studies by the world's leading experts of current knowledge about charrs. The evolution of charrs in many aspects parallels the evolution of man. The charrs evolved from more specialized, planktonophagous ancestors of a warm climate, into paedomorphic, less specialized, eternal juveniles, as did man from their pithecine ancestors into neotenic hominids. The neotenic charrs were able to invade the most inhospitable habitats; so were neotenic men. Salmonid fishes are the subject of more published work than any other fishes. This is influenced by the fact that salmonids share their environment with a group of hominids that up to now have produced most of the world literature. It is certainly not a reflection of the food or sport value of salmonids for the whole of mankind. But the significance of charrs, as of many other organisms, may be in more than just their usefulness to man. This book attempts to demonstrate this at least in part.

80-002736 Barton, B. A. SPAWNING MIGRATIONS, AGE AND GROWTH, AND SUMMER FEEDING OF WHITE AND LONGNOSE SUCKERS IN AN IRRIGATION RESERVOIR. *Can. Field-Nat.* 94(3):300-304. July-Sept. 1980. SFA 25(4)

[Fish. Br., Minist. Nat. Resour., Queens's Park, Toronto, ON M7A 1W3, Canada] During the upstream spawning migration in spring 1978 of suckers into an irrigation reservoir diversion canal, the best correlation was between movement and 'stream temperature X discharge.' White Suckers (*Catostomus commersoni*) remained in the canal longer than Longnose Suckers (*C. catostomus*), and males of both species remained longer than females. The rates of White and Longnose Suckers returning downstream were 52.4% and 59.2% respectively, indicating high mortality, possibly from predation during spawning. Minimum age of spawning was 5+ for males and 6+ for females of

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002736 CONTINUED White Suckers, and 4+ for males and 5+ for females of Longnose Suckers. In the lake, both species approached maturity at age 2 in males and age 3 in females. Annual growth in females was greater than in males after the age of first spawning. Cladocerans, mostly *Daphina*, were major food items in the reservoir during the summer 1977, being 33.7% of White Sucker diet and 74.2% of Longnose Sucker diet over a 4-mo period. Tendependidae were more important for White Suckers, contributing 21.0% of their food volume compared to 4.7% of food volume in Longnose Suckers. Feeding selectivity for *Daphina* by both sucker species was apparent.

80-002737 Bayer, R. D. SIZE, SEASONALITY, AND SEX RATIOS OF THE BAY PIPEFISH (*SYNGNATHUS LEPTORHYNCHUS*) IN OREGON. *Northwest Sci.* 54(3):161-167. Aug. 1980. SFA 25(4)

[423 SW 9th, Newport, OR 97365] Bay pipefish (*Syngnathus leptorhynchus*) captured in the Yaquina estuary, Oregon, ranged from 6.8 to 38.5 cm TL and from less than 0.2 to 20.3 g net weight. Most (63 percent) pipefish weighed less than 1.5 g. Females were proportionately longer than males. The length-weight relationship was log W = -3.70 + 3.12 log TL (cm). The greatest observed density was 0.10 pipefish/m^2; densities were greater during daylight than darkness. The sex ratio prior to and during the breeding season was as great as 4 females: 1 male for those longer than 17.0 cm TL, but apparently the sex ratio is inadequate to determine if males are ever in short supply. The breeding season extended from February to at least July. *Syngnathus leptorhynchus* were present throughout the year but were most abundant from December through May. In June, most pipefish emigrated away from the study area and may have moved up the estuary.

80-002738 Druzhinin, A. D. and N. A. Filstova. SOME DATA ON CROAKERS (FAMILY SCIAENIDAE) OF THE GULF OF ADEN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):149-151. 1979. SFA 25(4)

[VNIRO, Moscow, USSR] No less than 8 species of croakers inhabit the area off the south-east coast of the Arabian Peninsula: *Otolithes ruber*, *Atractoscion aequidens*, *Argyrosomus argentatus*, *A. marleyi*, *Protonibea deacanthus*, *Dendrophysa dussumieri*, *Umbrina capensis* and *U. sinuata*. In this region croakers live at depths of less than 100 m where the bottoms include sand in their composition or are stony. The largest size was noted in *A. aequidens* (68-86 cm) and *A. marleyi* (45-88 cm) the smallest in the red croaker *O. ruber* (22-41 cm). Larger red croaker specimens inhabit the Cape Fartak area than the Aden area. The age of the red croaker varied from 1+ to 4+ years.--Concl.

80-002739 Glazier, J. R. and C. A. Taber. REPRODUCTIVE BIOLOGY AND AGE AND GROWTH OF THE OZARK MINNOW, *DIONDA NUBILA*. *Copeia* 1980(3):547-550. 6 Sept. 1980. SFA 25(4)

[Dep. Life Sci., Southwest Mo. State Univ., Springfield 65802]

80-002740 Hunter, J. R. and C. A. Kimbrell. EARLY LIFE HISTORY OF PACIFIC MACKEREL, *SCOMBER JAPONICUS*. *NOAA Fish. Bull.* 78(1):89-101. 1980. SFA 25(4)

[NMFS, P.O. Box 271, La Jolla, CA 92038] The early life history of Pacific mackerel, *Scomber japonicus*, is described from laboratory-rearing studies and examination of stomach contents of sea-caught larvae. At 19°C mackerel eggs hatched in 56 hours, larvae were 3.1 mm standard length with a dry weight of 0.04 mg of which 50% was yolk. First feeding occurred 46 hours after hatching; all larvae fed by 60 hours (age 2.5 days). Larvae were then 3.6 mm long with fully pigmented eyes and 10% of the yolk remaining. Starvation was irreversible if larvae were not fed before age 4.5 days. Metamorphosis (15 mm standard length) occurred in 24 days at 16.8°C to 16 days at 22.1°C. Larvae 3-5 days old consumed 87% of their body weight per day and had a mean gross growth efficiency in dry weight of 33%. Oxygen consumption was 6.1μl O_2 per milligram dry weight per hour at

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002740 CONTINUED 18°C and 11.4μl O_2 per milligram dry weight per hour at 22°C. Swimming speeds ranged from 1.3 standard lengths per second for first-feeding larvae to 3.8 standard lengths per second for fish at metamorphosis. Fifty percent of the larvae were able to capture a prey when the width of the prey was 85% of the width of the mouth and 95% were able to do so when the prey was 57% of the width of the mouth. Cannibalism was common in rearing groups; at 8 mm standard length, 50% of the larvae became capable of feeind on other fish larvae and cannibalism ceased when schooling commenced. Chief food items of sea-caught larvae were stages of copepods; maximum food width increased rapidly with larval length and was equivalent to the maximum mouth width. Mean prey width was 38% of mouth width. The larger organisms, constituting half of the prey eaten, accounted for 85-90% of the total volume of food eaten.

80-002741 Kubo, T. [STUDIES ON THE LIFE HISTORY OF THE "MASU" SALMON (*ONCORHYNCHUS MASOU*) IN HOKKAIDO.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 34. p. 1-95. Mar. 1980. In Japanese with English summ. SFA 25(4)
[Nanae Fish.-Cult. Exp. Stn., Fac. Fish., Hokkaido Univ., Nanae, Hokkaido, Japan]

80-002742 Nemecek, R. J. THE COMPARATIVE ECOLOGY OF THREE SPECIES OF DARTERS IN THE GENUS *ETHEOSTOMA: ETHEOSTOMA VARIATUM* (KIRTLAND), *ETHEOSTOMA CAERULEUM* (STORER), AND *ETHEOSTOMA ZONALE* (COPE) IN THE ALLEGHENY RIVER DRAINAGE OF WESTERN NEW YORK. *Ph.D. dissertation, Saint Bonaventure Univ.* 175p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(2):491. Aug. 1980. SFA 25(4)
The distribution and comparative ecology of three species of darters, *Etheostoma variatum* (Kirtland), *E. caeruleum* (Storer), and *E. zonale* (Cope), were studied in the Allegheny River drainage of western New York. *E. caeruleum* was found to have the most extensive distribution and ascends the upstream portions of the larger creeks and tributaries to a greater extent than either *E. variatum* or *E. zonale*. *E. zonale* is is abundant wherever it is collected, but *E. variatum* is far less abundant due to the lack of suitable riffle habitat throughout the drainage. Preferences for water temperature, current velocities, water depth, vegetative covering, and substrate compositon were found to vary among the three species. *E. variatum* prefers riffles with fast current velocities and a bottom substrate composed of large cobble or boulder. *E. caeruleum* can be found in a variety of habitats ranging from moderately fast riffles to slow moving runs and pools. *E. zonale* prefers riffles with moderately fast current velocities and avoids the deeper, faster riffles as well as the deeper runs and pools. *E. zonale* is found in greater numbers in the riffles containing some vegetative covering. The lengths of the spawning seasons and the peak spawning periods in western New York were determined for all three species. The spawning seasons overlap and the same riffles may be used by all three darters for reproductive purposes. However, there appears to be little competition for spawning habitat. Observations on the reproductive behavior of *E. caeruleum* and *E. zonale* were made in the field during the study. Seasonal and daily feeding habits varied significantly among the three species and reduced compeition. In addition, the reliance upon some very abundant food sources such as the Chironomidae reduces any competition even further. In general, a sufficient amount of resource partitioning was found to exist and allows these three sympatric species to coexist in the riffle habitat.

80-002743 Ogasawara, Y. and T. Kawasaki. LIFE HISTORY OF MIGIGAREI, *DEXISTES RIKUZENIUS* (JORDAN ET STARKS), IN SENDAI BAY, WITH SPECIAL REFERENCE TO SEXUAL DIMORPHISM. *Tohoku J. Agric. Res.* 30(4):163-182. Mar. 1980. SFA 25(4)
[Dep. Fish. Sci., Fac. Agric., Tohoku Univ., Sendai, Japan] Migigarei are caught by the small trawlers in the 100-300 meters deep area and the catches

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002743 CONTINUED are especially abundant in the area 135-150 meters deep. The asymptotic body length of Bertalanffy's growth equation is from 16.4 to 18.4 cm in the male and 22.3-25.3 cm in the female. The maximum age is 9 years in the male and 13 years in the female among all the fish sampled. The maximum GSI is about 2 percent in the male and 30 per cent in the female. The spawning period is from late October to late January, with its peak in November to December. A female spawns several times in one spawning season. The regression of fecundity (F) on body length (BL) in cm is shown as $F=4.819BL^{3.618}$. The biological minimum size is 11.5 to 12.5 cm in the male and 13.5 to 15.0 cm in the female. Two years old individuals of both sexes that grow fast participate in spawning. The age when all the individuals spawn is 3 years in the male and 4 years in the female. *Ophiura* and polichaete are the major food of migigarei. In mature female annual change is observed in ovary-free body weight, liver weight, food intake, GSI and incidence of individuals with translucent zone at the periphery of otolith. The marked feature in the life history of migigarei is the conspicuous sexual dimorphism. In the case of females, the average length at a given age, maximum length, longevity, age at first maturing and GSI have considerably higher values than those of males. Sexual differences are observed more or less in the littoral or dermersal species, whereas in the fishes migrating in the surface or subsurface layers the difference in development or growth between sexes are small. The sexual differences are recognized as a strategy of littoral or demersal fishes to increase the egg number by means of allocating more resources to the female. Migigarei exhibit especially marked sexual differences among heterosomes. Migigarei feed on *Ophiura* of low calorid value and inhabit an especially adverse and poor environment. In these conditions it is supposed that the migigarei have selected a survival strategy to maximize the intersexual differences.

80-002744 Peterson, R. H.; R. H. Johansen and J. L. Metcalfe. OBSERVATIONS ON EARLY LIFE STAGES OF ATLANTIC TOMCOD, *MICROGADUS TOMCOD*. *NOAA Fish. Bull.* 78(1):147-158. 1980. SFA 25(4)
[Fish. Oceans Can., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] In southern New Brunswick, tomcod spawn in streams from late December to mid-January. The benthic eggs hatch and newly hatched larvae drift to sea in mid-March to mid-April at which time ocean temperatures are beginning to increase. Larval migration to sea is probably aided by active swimming of larvae to the surface to fill the swim bladder, which must be filled within 24 hours of hatching. Photopositivity of the larvae may assist in guiding larvae to the surface. Water content and specific gravity of eggs reared in 0°/oo were 2.8 mg and 1.030. Eggs reared at 10-30°/oo had about 2.3 mg water per egg. Specific gravity of eggs incubated in 10°/oo was constant for 27 days (at 2°-4°C) at 1.038, then decreased to 1.033. This decrease is associated with water uptake of 0.5-0.6 mg per egg and elimination of salt. The specific gravity of eggs incubated in 20°/oo declined linearly from 1.044 to 1.037, associated with accumulation of 0.2 mg of water and elimination of greater salt load. The specific gravity of eggs incubated at 30°/oo declined linearly from 1.049 to 1.045, associated with 0.1 mg water uptake and apparently insufficient salt elimination. Water uptake and salt excretion problems are minimized for eggs reared in freshwater, and under the experimental conditions described here. Normal development could not occur in continued exposure to 30°/oo. In natural spawning areas, the incubation medium is freshwater for most of the total cycle, with seawater invading the area only at extreme high tide. The salinity tolerance of tomcod eggs is compared with that of freshwater and marine fish eggs in general. Calculation of specific gravity of egg solids may prove a useful indirect way to investigate salt regulation in fish eggs.

80-002745 Rinne, J. N. NOTES ON THE OCCURRENCE AND BIOLOGY OF *XENOCLARIAS* GREENWOOD (SILURIFORMES: CLARIIDAE) IN LAKE VICTORIA, EAST AFRICA. *J. Nat. Hist.* 14(4):579-587. July-Aug. 1980. SFA 25(4)
[Rocky Mtn. For. Range Exp. Stn., Ariz. State Univ., Tempe 85281]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002746 Rupprecht, R. J. and L. A. Jahn. BIOLOGICAL NOTES ON BLUE SUCKERS IN THE MISSISSIPPI RIVER. *Trans. Am. Fish. Soc.* 109(3):323-326. May 1980. SFA 25(4)
[1903 Overdene Ave., Rockford, IL 61103]

80-002747 Setzler, E. M.; W. R. Boynton; K. V. Wood; H. H. Zion; L. Lubbers; N. K. Mountford; P. Frere; L. Tucker and J. A. Mihursky. SYNOPSIS OF BIOLOGICAL DATA ON STRIPED BASS, *MORONE SAXATILIS* (WALBAUM). *NOAA Tech. Rep. NMFS Circ.* 433. vi + 69p. June 1980. SFA 25(4)
[Univ. Md. CEES, Chesapeake Biol. Lab., Box 38, Solomons 20688]

80-002748 Stewart, D. D. A PRELIMINARY STUDY OF THE BIOLOGY OF THE STURGEON CHUB (*HYBOPSIS GELIDA*) IN THE POWDER RIVER IN WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:38-41. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[Box 15, Dep. Zool., Univ. Wyo., Laramie 82071] A study of the distribution and biology of the sturgeon chub, *Hybopsis gelida*, in the Powder River in northern Wyoming was conducted in 1979. Due to concern that the native range of this cyprinid has rapidly decreased, the habitat, feeding, reproduction and distribution were examined in detail. Habitat requirements such as water velocity, depths, substrate composition and positioning in the habitat were noted. Feeding behavior and preferred food sources were determined. This study disclosed that a stable population of sturgeon chubs exists in the Powder River from the mouth of Salt Creek in southeastern Johnson County to the Montana border in Wyoming. The sturgeon chub appears to have disappeared from the North Platte and Big Horn Rivers where it had previously been collected.

80-002749 Taubert, B. D. BIOLOGY OF SHORTNOSE STURGEON (*ACIPENSER BREVIROSTRUM*) IN THE HOLYOKE POOL, CONNECTICUT RIVER, MASSACHUSETTS. *Ph.D. dissertation, Univ. Mass.* 149p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):794. Sept. 1980. SFA 25(4)

80-002750 Tuunainen, P. HARJUKSEN, *THYMALLUS THYMALLUS* (L.) KASVU RAVINTO JA KANNAN IKÄRAKENNE NÄÄTÄMÖNJOEN VESISTÖN LATVAOSISSA. [THE GROWTH, FOOD AND AGE OF GRAYLING, *THYMALLUS THYMALLUS* (L.), FROM THE UPPER PART OF THE NÄÄTÄMÖNJOKI RIVER SYSTEM.] *Suom. Kalatalous* No. 48. p. 5-20. 1978. In Finnish with English summ. SFA 25(4)
[Riista-ja Kalatalouden Tutkimuslaitos, Kalantutkimuosasto PL 193, 00131 Hesinki 13, Finland] This study is part of a fisheries investigation on the Näätämönjoki river system in NE Lapland. The material examined from the River Vaijoki, which flows into Lake Iijärvi, the central lake of the Näätämönjoki system. The Vaijoki is in an almost natural state. Its length is about 27 km. Its upper course lies 259 m above sea level in the upper part of the fjeld birch zone. Lake Iijärvi is located in the fjeld birch zone at an altitude of 193 m. The total area of the Vaijoki is 71 ha, and 15 ha consists of rapids. Data are given on the water quality, temperature and rate of flow. In addition to grayling, the river contains whitefish, brown trout, burbot, pike, perch, ten-spined sticklebacks and minnows. The fishing intensity is very low. The material consisted of 57 grayling caught during 11--15.8. 1972 with gillnets and by angling. It was compared with 133 grayling collected by the same methods in 1956 and during 1970-1973 from the upper and middle course of the Ivalojoki, which flows into Lake Inarinjärvi, and from one of its tributaries, from the upper part of the Näätämönjoki and from the Kaldautsjoki, which flows into Lake Pulmankijärvi. In addition, 16 grayling were collected in 1972 from an area of 300 m^2 in the Hatsahtamjoki, which flows into Lake Iijärvi. The average growth rate of grayling in the Vaijoki proved to be slow compared with the rate in more southern regions, although it is similar to that in populations with a low fishing intensity in the same climatic zone. A feature

LIFE HISTORY-GENERAL WORKS (CONTINUED)

80-002750 CONTINUED of the grayling population in the River Vaijoki not found in neighbouring rivers is a high frequency of over ten-year-old fish. This longevity compensates for the low growth rate of the grayling in the Vaijoki, and they reach, or even exceed, the maximum size of over 1 kg achieved by grayling in more southern waters. Their diet is similar to that of grayling in other northern rivers. The growth rate did not show the clear decrease after the age of 6-8 years which is often observed elsewhere, and this may possibly be due to the presence of fish in the grayling diet. Comparison of the present results with information from other areas where the European grayling is found indicates that slow growing northern individuals often reach a greater age and a larger maximum size than the fast growing individuals of southern populations. Thermal and other climatic factors may possibly contribute to their longevity. Not all the grayling populations with low growth rates contain old fish, and, conversely, some populations with individuals with high growth rates include rather old grayling. A possible reason for this may be differences in fishing intensity.

80-002751 Zaret, T. M. LIFE HISTORY AND GROWTH RELATIONSHIPS OF *CICHLA OCELLARIS*, A PREDATORY SOUTH AMERICAN CICHLID. *Biotropica* 12(2):144-157. June 1980. In English with Spanish summ. SFA 25(4)
[Dep. Zool., Inst. Environ. Stud. FM-12, Univ. Wash., Seattle 98195] This paper examines the life history and growth relationships of *Cichla ocellaris*, a predatory South American cichlid. Data from extensive field studies in Gatun Lake, Panamá, where *C. ocellaris* was introduced, present a complete life history for this species from pair formation through parental care of the young. These data are relevant to fish management and culture efforts, since *C. ocellaris* is one of the few New World cichlid species which is exploited commercially. New interpretations of the evolution of parental care patterns in cichlids, and the possible significance of latitudinal differences in parental care patterns among guarders, are included. Creel surveys allow comparison of length/weight ratios from native habitats in Brazil and Venezuela, non-native habitats in Panamá and Hawaii, and non-native riverine habitats in Panamá. These results indicate that the pontential for long-term continuous harvest, it is greater in rivers.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

80-002752 Kaeding, L. R. OBSERVATIONS ON COMMUNITIES OF BROOK AND BROWN TROUT SEPARATED BY AN UPSTREAM-MOVEMENT BARRIER ON THE FIREHOLE RIVER. *Prog. Fish-Cult.* 42(3):174-176. July 1980. SFA 25(4)
[U.S. FWS, 2708 N. 4th St. Suite E-1, Flagstaff, AZ 86001]

80-002753 Kawamura, H. [DISTRIBUTION, MOVEMENT AND AGE CONSTITUTION OF THE COMMON FRESHWATER SCULPIN (*COTTUS POLLUX* GÜNTHER) IN THE SALMON PROPAGATION RIVER.] *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 17-24. Dec. 1979. In Japanese with English summ. SFA 25(4)
[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

80-002754 Kojima, H. and K. Sugiwaka. [THE GROWTH, INDIVIDUAL DENSITY AND STANDING CROP OF JUVENILE MASU SALMON IN THE ATSUTA RIVER, HOKKAIDO.] *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 7-16. Dec. 1979. In Japanese with English summ. SFA 25(4)
[Hokkaido Fish Hatchery, Makanoshima, Toyoshira-ku, Sapporo, Hokkaido, Japan] The growth, individual density and standing crop of juvenile masu

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

80-002754 CONTINUED salmon (*Oncorhynchus masou*) caught with casting nets, in order to promote the propagation of fish resources, were examined at three stations (pools) in the Atsuta River, Hokkaido, from July to October, 1978. The juveniles grew almost straightly from 6.5 to 10.1 cm in fork length during three months from July to October. The greater part of the fish population was occupied by fish of 6-7 cm in fork length in July, 8-9 cm in September, and two groups of 9-10 and 11-12 cm in October. It was considered that phase differentiation of the juveniles appeared in October. The individual density of juveniles, determined by marking method and removal method, changed scarcely (0.46-0.53/m^2). The standing crop of juveniles increased almost straightly and reached the maximum of 5.80 g (w.w.)/m^2 in October, showing the rise of 3.87 g (w.w.)/m^2 during 85 days. From these results, it is considered that the Atsuta River has the capability to produce enough feed to maintain greater amounts of juvenile masu salmon than those in now.

80-002755 Watt, W. D. and G. H. Penney. JUVENILE SALMON SURVIVAL IN THE SAINT JOHN RIVER SYSTEM. *Can. Dep. Fish. Oceans Tech. Rep.* No. 939. viii + 13p. May 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, Halifax, NS B3J 2S7, Canada] For the Saint John River system above Mactaquac Dam the number of actual virgin returns per female salmon spawner rose from 10 (per 8,000 eggs) for spawning year 1967 to a peak of 16 for 1969 and then declined to 3 for 1972. Most returns were in the fourth, fifth and sixth years after spawning. This rise and decline is attributed to a combination of poor juvenile survival (due to pollution) in the main stem of the Saint John River and to changes in the relative proportions of spawning adults released into the main stem and into the Tobique River (a tributary). The adult return average for salmon spawners in Tobique River was high (16.8 per 8,000 eggs), while for fish released into the main stem (Woodstock) and not migrating to the Tobique, the return rate was not significantly greater than zero (2.8 per 8,000 eggs). To maximize the number of wild salmon returns, it is recommended that the first priority should be to ensure an adequate egg-deposition density in Tobique River.

80-002756 Wilk, S. J.; W. G. Smith; D. E. Ralph and J. Sibunka. POPULATION STRUCTURE OF SUMMER FLOUNDER BETWEEN NEW YORK AND FLORIDA BASED ON LINEAR DISCRIMINANT ANALYSIS. *Trans. Am. Fish. Soc.* 109(3):265-271. May 1980. SFA 25(4)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

80-002757 Alekseyeva, Ye. I. and I. D. Tormosova. MATURATION, SPAWNING AND FECUNDITY OF THE NORTH SEA HADDOCK, *MELANOGRAMMUS AEGLEFINUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):56-64. 1979. SFA 25(4)
[AtlantNIRO, Kaliningrad, USSR]

80-002758 Chan, E. H. and T. E. Chua. REPRODUCTION IN THE GREENBACK GREY MULLET, *LIZA SUBVIRIDIS* (VALENCIENNES, 1836). *J. Fish Biol.* 16(5):505-519. May 1980. SFA 25(4)
[Fac. Fish. Mar. Sci., Univ. Agric. Malaysia, Serdang, Seangor, Malaysia] This paper presents data on the reproductive biology of *Liza subviridis*, a little studied mullet species. The fish is heterosexual, exhibiting external fertilization. Six maturity stages can be macroscopically identified in the testes and seven in the ovaries. The macroscopic changes in the gonads are manifestations of histological changes occurring in the development of

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002758 CONTINUED sperm cells and oocytes. First sexual maturity is attained in the length ranges of 9.5-11.5 cm and 10.5-11.5 cm in male and female fish respectively. The fecundity for fish measuring 10.3-13.9 cm in standard length ranged from 40,000-145,000 eggs. The relationship between fecundity (F) and length (L) can be represented as: $F=1.9044\ L^{4.2998}$. The spawning duration in *L. subviridis* is restricted to a short and definite period, with all ripe ova being released within a single spawning act. A pronounced spawning season can be detected to extend from June to November. However, during off-seasons, some spawning also occurs. The correlations between spawning, rainfall and air temperature is discussed.

80-002759 Curry, K. D. USE OF A WABASH RIVER TRIBUTARY FOR SUCKER (CATOSTOMIDAE) REPRODUCTION. *Ph.D. dissertation, Purdue Univ.* 110p. 1979. From Diss. Abstr. Int. B Sci. Eng. 41(1):54. July 1980. SFA 25(4)

80-002760 De Silva, S. S. and J. Chandrasoma. REPRODUCTIVE BIOLOGY OF *SAROTHERODON MOSSAMBICUS*, AN INTRODUCED SPECIES, IN AN ANCIENT MAN-MADE LAKE IN SRI LANKA. *Environ. Biol. Fishes* 5(3):253-259. 29 Sept. 1980. SFA 25(4)

[Dep. Zool., Ruhuma Univ. Coll., Matara, Sri Lanka] The reproductive biology of *Sarotherodon mossambicus* (Peters), a species exotic to Sri Lanka, was studied in Parakrama Samudra -- an ancient man-made lake. Females outnumbered males by approximately 2 to 1, but the predominance of females tended to decrease with increasing size. Males mature at a length of 27.5 cm and females at a length less than 15.0 cm. *S. mossambicus* breeds throughout the year with four possible peak periods, which coincide with the tailend of the monsoon and intermonsoon rains. The egg diameter distribution indicates the presence of reserve oocytes and yolked oocytes, the latter falling into a single mode between 1.2 to 3.6 mm. Fecundity varied between 360 and 1775 for fish ranging in length from 20.0 to 31.9 cm and 145 to 538 g in weight. The diameter of nests increased with depth up to 60-65 cm. Nests were not found in depths over 90 cm.

80-002761 Downhower, J. F. and L. Brown. MATE PREFERENCES OF FEMALE MOTTLED SCULPINS, *COTTUS BAIRDI*. *Anim. Behav. (Bailliere-Tindall, Publ.)* 28(3):728-734. Aug. 1980. SFA 25(4)

[Dep. Zool., Ohio State Univ., Columbus 43210] Experimental manipulation of breeding site quality did not alter the mate preference of female mottled sculpins (*Cottus bairdi*). Females of this species appear to choose mates on the basis of male size. By choosing a larger male, a female increases the probability that some of her eggs will hatch because large males are unlikely to abandon their nest sites.

80-002762 Dyagilev, S. Ye. and N. B. Markevich. DIFFERENT TIMES OF MATURATION OF THE PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, IN EVEN AND UNEVEN YEARS AS THE MAIN FACTOR RESPONSIBLE FOR DIFFERENT ACCLIMATIZATION RESULTS IN THE NORTHWESTERN USSR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):30-44. 1979. SFA 25(4)

[VNIRO, Moscow, USSR] Data on the spawning times of the pink salmon, *Oncorhynchus gorbuscha*, in even and uneven years of reproduction in the northwestern USSR are examined. Pink salmon from the even year line constantly mature 2-3 weeks later than pink salmon from the uneven year line. At the temperature conditions observed in egg development this leads to constant mortality in the even line and to a relatively high rate of survival in the uneven line. Different spawning times produced different results in the acclimatization of the pink salmon in the lines of even and uneven years of reproduction.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002763 Fursa, T. I. ON THE SEASONAL NATURE OF THE SPAWNING OF FISHES IN THE EASTERN PART OF THE ARABIAN SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):66-74. 1979. SFA 25(4)

[AzCherNIRO, Kerch, USSR] On the basis of the results of 942 ichthyoplankton samples, of an analysis of the stages of gonad maturity of 14,150 females and also of the correlation of published data, the seasonal nature of the reproduction of fish in the eastern part of the Arabian Sea, depending on monsoon periods, is examined.

80-002764 Grimes, C. B. and G. R. Huntsman. REPRODUCTIVE BIOLOGY OF THE VERMILION SNAPPER, *RHOMBOPLITES AURORUBENS*, FROM NORTH CAROLINA AND SOUTH CAROLINA. *NOAA Fish. Bull.* 78(1):137-146. 1980. SFA 25(4)

[Dep. Environ. Resour., Cook Coll. N. J. Agric. Exp. Stn., Rutgers Univ., New Brunswick, NJ 08903] The vermilion snapper, *Rhomboplites aurorubens*, a species often associated with Caribbean reefs and banks, is an important recreational fish of the outer continental shelf of North Carolina and South Carolina. Serial spawning occurs from late April through September off the Carolinas at depths ranging from 31 to 91 m. Most females spawn in the third or fourth year at about 205-275 mm total length. Larger, older females (age 5-10; up to 530 mm total length) appear to spawn longer each reproductive season, which may be an optimal strategy for maximizing reproductive biomass (balancing the physiological costs of somatic and gonadal growth). Overall sex ratio is unequal in favor of females (approximately 60%), but the ratio is 1:1 for small fish (less than 150 mm total length) and heavily in favor of large females (69-100% for fish greater than 500 mm total length) because they live longer than males. Fecundity of first spawners is estimated at 17-42 thousand eggs, and large females produce 1.5 million eggs.

80-002765 Gross, M. R. and W. A. Nowell. THE REPRODUCTIVE BIOLOGY OF ROCK BASS, *AMBLOPLITES RUPESTRIS* (CENTRARCHIDAE), IN LAKE OPINICON, ONTARIO. *Copeia* 1980(3):482-494. 6 Sept. 1980. SFA 25(4)

[Dep. Zool., Univ. Wash., Seattle 98195] The reproductive behavior of rock bass in Lake Opinicon begins with an abrupt movement of mature males to inshore nesting areas. Inshore density increases several fold and males become territorial, defending a bottom area in which they construct a nest by anal and pectoral fin displacement of the substrate. This results in a bowl shaped depression about 1.9 times male size. Nests are typically in coarse substrate and at 1/2 to 3/4 m water depth. Reproductive males (mean age 7.5 years) tolerate concurrently nesting pumpkinseed (*Lepomis gibbosus*) within half the distance separating neighboring rock bass. Males can complete a nest in one day but usually spawn after two days. Spawning activity occurs in late May depending upon water temperature. Females showed peak reproductive behaviors at 21-23 C. Gravid females approach and enter nests without male courtship and spawn about 500 eggs. During the spawning act the male's body color darkens. Circling behavior in the nest is irregular and the female is often exterior to the nest center. The eggs are emitted over a 2-hour period with the horizontal dipping motions common to centrarchids. One female may spawn with several males and one male may spawn with several females. However, despite this apprent promiscuity, it appears that females may choose males with which to spawn the majority of their eggs. Following spawning females leave the nest area and males provide parental care for eggs by fanning with the pectoral fins, and for larvae through predator defense. Males are highly aggressive and often charge towards a territory intruder with spread opercles or displaying an open mouth. About 33% of nests are unsuccessful, possibly due to brood predation. Eggs hatch after 5 days and fry leave the nest 9-10 days later. Twenty-four % of the males respawn, usually in new nests but in the same area. Females can also spawn again, as indicated by modal egg classes in the ovary. Most reproductive activity is confined within a three week period, but males raising a second brood remain with nests until late June or early July. Following nesting, the inshore density of rock bass returns to a prereproductive level.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002766 Gross, M. R. SEXUAL SELECTION AND THE EVOLUTION OF REPRODUCTIVE STRATEGIES IN SUNFISHES (*LEPOMIS*: CENTRARCHIDAE). *Ph.D. dissertation, Univ. Utah* 330p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(2):452. Aug. 1980. SFA 25(4)

80-002767 Lisovenko, L. A. and Z. S. Sil'yanova. THE FECUNDITY OF SOME SPECIES OF THE FAMILY NOTOTHENIIDAE IN THE ATLANTIC SECTOR OF THE SOUTHERN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):79-85. 1979. SFA 25(4)

[VNIRO, Moscow, USSR] On the basis of the calculation of the individual fecundity of 267 specimens of fish belonging to 6 species of the genus *Notothenia* and one species of the genus *Trematomus*, a correlation-regression analysis of the dependence of fecundity on the length and weight of the female, investigation of the fecundity of fish of different ages and calculation of the index of population fecundity according to Ivlev, have been carried out by means of the Minsk-32 computer. It is shown that all these species may be divided into two groups, which differ as regards population fecundity.

80-002768 Lobel, P. S. and R. E. Johannes. NESTING, EGGS AND LARVAE OF TRIGGERFISHES (BALISTIDAE). *Environ. Biol. Fishes* 5(3):251-252. 29 Sept. 1980. SFA 25(4)

[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

80-002769 Lund, R. VIVIPARITY AND INTRAUTERINE FEEDING IN A NEW HOLOCEPHALAN FISH FROM THE LOWER CARBONIFEROUS OF MONTANA. *Science* 209(4457):697-699. 8 Aug. 1980. SFA 25(4)

[Dep. Biol., Adelphi Univ., Garden City, NY 11530] A new species of Lower Carboniferous holocephalan chondrichthyan, *Delphyodontos dacriformes*, is described from two fetal specimens. The well-developed slashing and piercing dentition, enlargement of the abdominal region, and fecal material indicate the probable evolution of intrauterine oophagy and viviparity in Paleozoic Chondrichthyes.

80-002770 Moosleitner, H. ZENTRALE LAICHSTELLE ERMÖGLICHT *BLENNIUS PAVO*, RISSO 1810 (BLENNIIDAE, PERCIFORMES, TELEOSTEI) DIE BESIEDLUNG VON SANDGRUND. [A CENTRAL HATCHING HABITAT ENABLES *BLENNIUS PAVO*, RISSO 1810 (BLENNIIDAE, PERCIFORMES, TELEOSTEI) THE OCCUPATION OF SANDY BOTTOMS.] *Zool. Anz.* 204(1/2):82-88. 1980. In German with English summ. SFA 25(4)

[Zool. Inst., Univ. Salzburg, Austria]

80-002771 Morse, W. W. MATURITY, SPAWNING, AND FECUNDITY OF ATLANTIC CROAKER, *MICROPOGONIAS UNDULATUS*, OCCURRING NORTH OF CAPE HATTERAS, NORTH CAROLINA. *NOAA Fish. Bull.* 78(1):190-195. 1980. SFA 25(4)

[NMFS, Sandy Hook Lab., Highlands, NJ 07732]

80-002772 Morse, W. W. SPAWNING AND FECUNDITY OF ATLANTIC MACKEREL, *SCOMBER SCOMBRUS*, IN THE MIDDLE ATLANTIC BIGHT. *NOAA Fish. Bull.* 78(1):103-108. 1980. SFA 25(4)

[NMFS, Sandy Hook Lab., Highlands, NJ 07732] Collections of Atlantic mackerel, *Scomber scombrus*, were made during spring 1977 from Maryland to Rhode Island. Length-weight relationships were determined for total and fork lengths and total and gutted weights. Spawning time was determined from gonad somatic indices and peak spawning occurred between 21 April and 4 May. Egg diameter frequencies from running ripe ovaries indicated five to seven egg batches are spawned by each female during the spawning season. Fecundity was estimated and ranged from 285,000 to 1,980,000 for fish between 307 and 438 mm fork length. Fecundity was related to fork length, gutted weight, and age.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002773 Pagel, P. M.; R. MacGregor III and W. Siler. BEHAVIORAL STUDIES OF THE TELEOST *FUNDULUS GRANDIS*. *J. Ala. Acad. Sci.* 51(3):183. July 1980. Abstract only. SFA 25(4)

[Dep. Biol., Univ. Ala., Birmingham 35294] Qualitative observations were made on reproductive and agonistic behaviors of the estaurine Gulf Killifish, *Fundulus grandis*. Adult fish were maintained on a stimulatory photoperiod of LD 15:9 at approximately 22°C. Reproductive behavior patterns include herding, quivering, clasping and spawning. Unreceptive behavior by female includes fleeing, chasing and an "unreceptive stance." Agonistic behavior includes rapid approach, chase, lateral display, operculum spread, tailbeat, head-to-tail bout and occasional mouth lock. Submissive behavior includes fleeing and hiding. All agonistic behaviors have been seen in both sexes in male-male encounters and also in male-female encounters. There may be the potential for limited parental care although it has not been established and whether or not this occurs in the fish's natural habitat. Reproductive and agonistic coloration patterns were observed. Coloration and size of fish are both important factors involved with social interaction in *F. grandis*.

80-002774 Pietsch, T. W. and D. B. Grobecker. PARENTAL CARE AS AN ALTERNATIVE REPRODUCTIVE MODE IN AN ANTENNARIID ANGLERFISH. *Copeia* 1980(3):551-553. 6 Sept. 1980. SFA 25(4)

[Coll. Fish., Univ. Wash., Seattle 98195]

80-002775 Purych, P. R. SUCCESSFUL REPRODUCTION OF INTRODUCED LAKE TROUT IN HORNER LAKE, ONTARIO. *Prog. Fish-Cult.* 42(3):163-164. July 1980. SFA 25(4)

[Ontario Minist. Nat. Resour., Blind River Dist., Blind River, ON P0R 1B0, Canada]

80-002776 Rosa, E. and C. Williams. THE REPRODUCTIVE SYSTEM OF ONE SPECIES OF THE FAMILY CARCHARINIDAE. *J. Ala. Acad. Sci.* 51(3):184-185. July 1980. Abstract only. SFA 25(4)

[Dep. Biol., Carver Res. Lab., Tuskegee Inst., Tuskegee Institute, AL 36088]

80-002777 Sargent, R. C. and J. B. Gebler. EFFECTS OF NEST SITE CONCEALMENT ON HATCHING SUCCESS, REPRODUCTIVE SUCCESS, AND PATERNAL BEHAVIOR OF THE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*. *Behav. Ecol. Sociobiol.* 7:137-142. 1980. SFA 25(4)

[Dep. Ecol. Evol., State Univ., N.Y., Stoney Brook 11794]

80-002778 Shikhshabekov, M. M. THE REPRODUCTIVE BIOLOGY OF THE "KUTUM", *RUTILUS FRISII KUTUM*, THE ASP, *ASPIUS ASPIUS*, THE VIMBA, *VIMBA VIMBA PERSA*, AND THE RUDD, *SCARDINIUS ERYTHROPHTHALMUS*, IN THE WATERS OF DAGESTAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):98-105. 1979. SFA 25(4)

[Dagestan Agric. Inst., Makhachkala, USSR]

80-002779 Spivak, E. G.; G. N. Pinus and S. V. Sentishcheva. THE AGE COMPOSITION OF THE SPAWNING POPULATION AND THE CHARACTERISTICS OF THE SPAWNERS SIZE-AGE STRUCTURE AND FECUNDITY OF THE ROACH, *RUTILUS RUTILUS* SPAWNING IN KAKHOVKA RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):75-80. 1979. SFA 25(4)

[VNIRO, Moscow, USSR]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

80-002780 Sukhanova, G. I. THE SPAWNING AND FECUNDITY OF THE PIKE, *ESOX LUCIUS*, IN VILYUY RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):74-79. 1979. SFA 25(4)

[Dep. Ichthyol. Hydrobiol., Tomsk Univ., USSR] Information is given on the ecology of spawning of the pike, *Esox lucius*, from Vilyuy reservoir. Changes in fecundity are related to age and size of the fish, weight of gonads and egg diameter. It is shown that in Vilyuy reservoir the individual absolute fecundity of the pike is lower than in other bodies of water situated further south.

80-002781 Timmons, T. J.; W. L. Shelton and W. D. Davies. GONAD DEVELOPMENT, FECUNDITY, AND SPAWNING SEASON OF LARGEMOUTH BASS IN NEWLY IMPOUNDED WEST POINT RESERVOIR, ALABAMA-GEORGIA. *U.S. Fish Wildl. Serv. Tech. Pap.* 100. 6p. 1980. SFA 25(4)

[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn 36830] The percentage of body weight contributed by the ovaries and frequency distributions of ovarian egg diameters were reliable indicators of the spawning season of largemouth bass, *Micropterus salmoides*, in West Point Reservoir in 1977. Spawning begam in mid-April and continued until mid-June. Some fish apparently spawned more than once, but no summer or fall spawning was indicated. Individual fecundity, determined by a dry weight method, ranged from 6,232 to 117,241 mature eggs for fish over 300 mm in total length. Fish shorter than 300 mm contributed few of the eggs produced. Eggs matured at a size larger than those described in other studies of largemouth bass. Regression equations were developed to describe the relation of fecundity to length, weight, and age; weight yielded the best correlation; Y=1,908.36 + 30.81 X. The fast-growing initial year classes (1975 and 1976) of largemouth bass dominated the reproducing population.

80-002782 Tricas, T. C. COURTSHIP AND MATING-RELATED BEHAVIORS IN MYLIOBATID RAYS. *Copeia* 1980(3):553-556. 6 Sept. 1980. SFA 25(4)

[Dep. Zool., Univ. Hawaii Manoa, Honolulu 96822]

80-002783 Veshchev, P. V. COMPOSITION OF THE SPAWNING POPULATION OF THE STURGEON, *ACIPENSER GÜLDENSTÄDTI* AND THE SEVRYUGA, *ACIPENSER STELLATUS*, IN THE SPAWNING GROUNDS OF AKHTUBA RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):151-155. 1979. SFA 25(4)

[TsNIORKh, Astrakhan, USSR] An analysis of the results of the size-weight and age composition of sturgeon spawners from Akhtuba river has shown that, compared with the Volga, the youngest and smallest fish move to spawn in the Akhtuba river spawning grounds. The mean age of sturgeon females and males was 20.9 and 16.1 years respectively, that of sevryuga females and males 16.8 and 13.5 years respectively. The mean absolute fecundity of sturgeon females in the Akhtuba river spawning grounds was 187.2 thousand eggs and that of the sevryuga 274.4 thousand eggs. The high mean absolute fecundity may be explained by the greater number of older females. Fish with gonads in stage V of maturity predominated among sturgeon spawners in Aktuba river, fish in completed stage IV of maturity among sevryuga spawners. Males predominated over females in the spawning population of the sturgeon, but in the sevryuga population females predominated over males. This may later lead to a curtailment of the sevryuga population. Under conditions of regulated discharge, the Akhtuba river should be preserved as a fisheries water body, of primary significance for the maintenance of sturgeon stocks.

80-002784 Wagner, W. C. and T. M. Stauffer. THREE-YEAR-OLD PINK SALMON IN LAKE SUPERIOR TRIBUTARIES. *Trans. Am. Fish. Soc.* 109(4):458-460. July 1980. SFA 25(4)

[Marquette Fish. Res. Stn., Mich. Dep. Nat. Resour., 484 Cherry Creek Rd., Marquette 49855]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

80-002785 Andriashev, A. P. [ON THE DEEPEST OCCURENCE OF A ZOARCID FISH (*LYCENCHELYS ATACAMENSIS* SP. N.) FROM THE ATACAMA TRENCH.] *Zool. Zh.* 59(7):1105-1108. July 1980. In Russian with English summ. SFA 25(4)
[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

80-002786 Duncan, T. O. and M. R. Myers, Jr. MOVEMENTS OF CHANNEL CATFISH AND FLATHEAD CATFISH IN BEAVER RESERVOIR, NORTHWEST ARKANSAS. *Proc. Ark. Acad. Sci.* 32:43-45. 1978. SFA 25(4)
[U.S. FWS, Multi-Outlet Reservoir Stud., Arkadelphia, AR 71923]

80-002787 Loeb, V. J. VERTICAL DISTRIBUTION AND DEVELOPMENT OF LARVAL FISHES IN THE NORTH PACIFIC CENTRAL GYRE DURING SUMMER. *NOAA Fish. Bull.* 77(4):777-793. 1980. SFA 25(4)
[Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

80-002788 Love, M. S. ISOLATION OF OLIVE ROCKFISH, *SEBASTES SERRANOIDES*, POPULATIONS OFF SOUTHERN CALIFORNIA. *NOAA Fish. BUll.* 77(4):975-983. 1980. SFA 25(4)
[Dep. Biol., Occidental Coll., 1600 Campus Rd., Los Angeles, CA 90041] Movements of the olive rockfish, *Sebastes serranoides*, off Santa Barbara, California, were investigated, using mechanical and parasite tags. The movements were restricted over shallow reefs though somewhat less so around deeper oil platforms. Highly restricted movements may cause greater vulnerability of populations to overfishing--comparisons of olive rockfish size frequencies between two reefs indicated that fishing pressure had reduced olive rockfish populations to almost all prereproductive individuals on the more heavily fished site.

80-002789 Ruggles, C. P. A REVIEW OF THE DOWNSTREAM MIGRATION OF ATLANTIC SALMON. *Can. Tech. Rep. Fish Aquatic Sci.* No. 952. ix + 39p. July 1980. In English with French summ. SFA 25(4)
[Montreal Eng. Co., Ltd., 1526 Dresden Row, Halifax, NS, Canada]

FOODS/FEEDING

80-002790 Arnemo, R.; C. Puke and N. G. Steffner. FEEDING DURING THE FIRST WEEKS OF YOUNG SALMON IN A POND. *Arch. Hydrobiol.* 89(1-2):265-273. 1980. In English with Russian summ. SFA 25(4)
[Högskolan i Kalmar, Inst. Naturvet. Tek. Box 905, 391 29 Kalmar, Sweden] The first feeding of salmon, implanted in a pond, is shown to be zooplankton, especially *Heterocope saliens*. For the first 20 days each salmon consumes approximately 200 ind of this species, making up about half of the food. The total zooplankton consumption is calculated to be about 0.15 g fresh weight. The salmon grows from 26 to 37 mm. It is suggested that zooplankton sampling may be used as a method for predicting the growth of the fish.

80-002791 Beyer, J. E. FEEDING SUCCESS OF CLUPEOID FISH LARVAE AND STOCHASTIC THINKING. *Dana* 1:65-91. 1980. SFA 25(4)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] Feeding success is defined as the probability of capturing the prey organism assuming attack and is derived from basic principles as a function of the mouth size of the predator, the prey width

FOODS/FEEDING (CONTINUED)

80-002791 CONTINUED and the precision of the feeding strike. The model is evaluated with reference to data from the literature on larval anchovy (*Engraulis mordax*) and larval herring (*Clupea harengus*) feeding on *Artemia* nauplii. A theoretical attack-index of prey size preferences is obtained from the model under the assumption that larvae attempt to achieve maximum food consumption. Optimum prey width appears to be linearly related to larval mouth size.

80-002792 Bryazgunova, M. I. FEEDING RELATIONSHIPS OF THE YOUNG OF THE PIKE-PERCH, *LUCIOPERCA LUCIOPERCA*, THE BREAM, *ABRAMIS BRAMA*, AND FISHES OF LESSER IMPORTANCE IN THE LOWER REACHES OF THE DON. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):57-65. 1979. SFA 25(4)
[AzNIIRKh, Rostov-on-Don, USSR]

80-002793 Buchanan, D. V.; R. M. Hooton and J. R. Moring. NORTHERN SQUAWFISH (*PTYCHOCHEILUS OREGONENSIS*) PREDATION ON JUVENILE SALMONIDS IN THE WILLAMETTE RIVER BASIN. *Oreg. Dep. Fish. Wildl. Inf. Rep. Ser. Fish.* No. 80-2. 15p. Mar. 1980. SFA 25(4)
[Oreg. Dep. Fish. Wildl., Res. Dev. Sect., Corvallis]

80-002794 Cadwallader, P. L.; A. K. Eden and R. A. Hook. ROLE OF STREAMSIDE VEGETATION AS A FOOD SOURCE FOR *GALAXIAS OLIDUS GÜNTHER* (PISCES: GALAXIIDAE). *Aust. J. Mar. Freshwater Res.* 31(2):257-262. Apr. 1980. SFA 25(4)
[Fish. Wildl. Div., Minist. Conserv., Snobs Creek Freshwater Fish. Res. Stn. Hatchery, P.B. 20, Alexandra, Victoria 3714, Australia] Dipteran and trichopteran larvae, coleopteran adults and terrestrial invertebrates were the main items in the diet of *G. olidus* taken in summer from 10 stations in the Seven Creeks River system, Victoria. Ephemeropteran nymphs, coleopteran larvae and copepods also formed a large part of the diet. Terrestrial organisms were taken more frequently by larger fish than by smaller fish and formed a substantial part of the diet of those fish taken from sites surrounded by overhanging vegetation. Terrestrial organisms were much less common in the diet of fish taken from sites with little overhanging vegetation.

80-002795 Coates, D. AQUARIUM STUDIES ON THE ABILITY OF POTENTIAL PREDATORS TO LEARN TO AVOID HUMBUG DAMSELFISH, *DASCYLLUS ARUANUS* (PISCES, POMACENTRIDAE) AS PREY. *J. Comp. Ethol.* 52(3):285-290. 1980. SFA 25(4)
[Dep. Biol. Sci., Univ. Gezira, Sudan] Five species of potential predators of *D. aruanus* were trained in aquaria using a simple reward versus no-reward training technique in which *D. aruanus* (no-reward) and a variety of alternative prey species (reward) were presented simultaneously to the former. All the predators tested exhibited an ability to learn to approach the reward species of fish in preference to *D. aruanus*. Results are discussed in relation to the recently proposed theory that potential predators may learn in the field not to attack *D. aruanus* but to concentrate on alternative and more easily caught prey.

80-002796 Cordes, L. E. and L. M. Page. FEEDING CHRONOLOGY AND DIET COMPOSITION OF TWO DARTERS (PERCIDAE) IN THE IROQUOIS RIVER SYSTEM, ILLINOIS. *Am. Midl. Nat.* 104(1):202-206. July 1980. SFA 25(4)
[Ill. Nat. Hist. Surv., Urbana 61801] *Etheostoma microperca* and *E. zonale* are diurnal carnivores. Feeding activity in both species increased markedly (on 9-10 September 1977) after sunrise, peaked at midday, and decreased after sunset. *Etheostoma microperca* fed mainly on copepods (38-76% of all food items); in late afternoon the diet contained fewer copepods than usual and more chironomids. *Etheostoma zonale* fed most heavily on chironomids (59-96%) at all hours.

FOODS/FEEDING (CONTINUED)

80-002797 Crowder, L. B. ALEWIFE, RAINBOW SMELT AND NATIVE FISHES IN LAKE MICHIGAN: COMPETITION OR PREDATION? *Environ. Biol. Fishes* 5(3):225-233. 29 Sept. 1980. SFA 25(4)

[Dep. Zool., Univ. Wis., Madison 53706] Several native fish species in Lake Michigan became rare or locally extinct during the increase of rainbow smelt (1930s) and alewife (1950s-1960s). These particular native species have pelagic eggs or larvae which were large relative to the zooplankton and which co-occurred with feeding alewife, smelt or both. Alewife, smelt and most of the other planktivores in the lake probably consumed eggs, and at least alewife and smelt are known to consume larvae. For each species, I comment on the probable role of predation on early life history stages in their decline. Several species which currently co-exist with alewife and smelt have shown large scale declines during the increase of the exotics. Recruitment declines were often dramatic and the proabability of predation on these species during their early life history is evaluated.

80-002798 Cuff, W. R. BEHAVIORAL ASPECTS OF CANNIBALISM IN LARVAL WALLEYE, *STIZOSTEDION VITREUM. Can. J. Zool.* 58(8):1504-1507. Aug. 1980. In English with French summ. SFA 25(4)

[CSIRO, Div. Computing Res., P.O. Box 1800, Canberra, A.C.T., Australia 2601] Behavioral aspects of cannibalism in larval walleye (*Stizostedion v. vitreum*) are described. Conspecific prey were taken both head and tail first. Tail-first cannibalisms sometimes occurred wherein the cannibalized walleye was not ingested completely. This made it possible for a cannibal with partly-ingested prey to be cannibalized and "chains" of up to four fish were observed. As all larval walleye were roughly the same size, this observation suggests that larval walleye will take prey longer than themselves. This was also apparent from head-first encounters, with each fish trying to cannibalize the other.

80-002799 Gerking, S. D. and D. V. Plantz, Jr. SIZE-BIASED PREDATION BY THE GILA TOPMINNOW *POECILIOPSIS OCCIDENTALIS* (BAIRD AND GIRARD). *Hydrobiologia* 72(1-2):179-191. 10 July 1980. SFA 25(4)

[Dep. Zool., Ariz. State Univ., Tempe 85281] The objective of this study is to document under both field and laboratory conditions the phenomenon of size-biased feeding by the Gila topminnow, *Poeciliopsis occidentalis*, and to shed light on the mechanisms responsible for this process. Adult female Gila topminnows feed in Monkey Spring, Santa Cruz County, Arizona, on a variety of food items, but *Hyalella azteca* is an important element of its invertebrate diet. The size of the amphipods ingested by female topminnows is a function of the size of the fish, with larger fish taking larger prey. There is also a strong preference for topminnows to select large amphipods from within the size limits imposed by the width of the mouth. The correlation between fish size and prey size was also seen in the laboratory, utilizing *Daphnia similis* and food pellets as prey. The tendency to select large prey from a range of available sizes was prominent with both *Daphnia* and pellets. The feeding period in the laboratory is characterized by two distinct phases. During the first phase, feeding is rapid and nonselective. As the feeding progresses, the rate of feeding drops dramatically and selectivity increases. More complex laboratory feeding experiments gave equivocal results. When fish were presented pellets of two sizes at different densities and at different ratios of small to large, size biased feeding was not clearly evident. Both predator and prey densities, agonistic behavior, and reaction distance should be explored more thoroughly as next steps in attempts to mimic feeding behavior in nature.

80-002800 Gibson, R. M. OPTIMAL PREY-SIZE SELECTION BY THREE-SPINED STICKLEBACKS (*GASTEROSTEUS ACULEATUS*): A TEST OF THE APPARENT-SIZE HYPOTHESIS. *J. Comp. Ethol.* 52(3):291-307. 1980. SFA 25(4)

FOODS/FEEDING (CONTINUED)

80-002800 CONTINUED
[Arbeitsgruppe Verhaltensforsch., Abt. Biol., Ruhr Univ. Bochum, West Germany] The causal basis of optimal prey-size selection was investigated experimentally using Three-spined Sticklebacks (*Gasterosteus aculeatus*) as predators and two size classes of *Daphnia magna* as prey. When offered a choice between a large and a small daphnia sticklebacks took the apparently-larger prey, irrespective of its absolute size. However, the apparent size rule did not correctly predict the diet of fish feeding on mixed populations of the same two size classes, except at low prey densities. The observed pattern of predation was consistent with optimal diet theory.

80-002801 Goh, Y. and T. Tamura. OLFACTORY AND GUSTATORY RESPONSES TO AMINO ACIDS IN TWO MARINE TELEOSTS--RED SEA BREAM AND MULLET. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 66(2):217-224. 1980. SFA 25(4)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya, Japan] The olfactory and gustatory responses to amino acids were recorded electrophysiologically in two stocks of red sea bream (*Chrysophyrys major*) and mullet (*Mugil cephalus*). The olfactory spectra of amino acids determined from the bulbar response in the two stocks of red sea bream were more or less same, and the spectrum in mullet was also similar to that in the red sea bream. A comparison of the spectra revealed high similarity among intra- and inter-species. The gustatory spectra of amino acids were similar between the different two stocks of red sea bream, but the spectra were different from those obtained in other fishes. The gustatory spectrum of amino acids in mullet was different from that in other fishes. A comparison of the gustatory spectra revealed a species specificity. From the view of the species non-specificity of the olfactory spectrum of amino acids and the species specificity of the gustatory one, the functional difference between the olfactory and the gustatory response to amino acids in the feeding behaviour was discussed.

80-002802 Goh, Y. and T. Tamura. EFFECT OF AMINO ACIDS ON THE FEEDING BEHAVIOUR IN RED SEA BREAM. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 66(2):225-229. 1980. SFA 25(4)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya, Japan] The effects of amino acids and betaine on the feeding behaviour of red sea bream (*Chrysophyrs major*) were studied by adding the chemicals to a casein-base purified diet. Among the 15 chemicals tested, 1/2 (alanine + Betaine), 1/2 glycine + betaine), L-alanine, L-valine, glycine, L-serine, L-arginine and L-glutamine were found to be effective in activating the feeding behavior. The behavioural experiments were concluded to harmonize well with the electrical activities of the gustatory system rather than those of the olfactory system.

80-002803 Goldschmid, A.; K. Kotrschal; W-D. Krautgartner and H. Adams. MORPHOLOGIE DES GEBISSES UND NAHRUNGSPRÄFERENZEN VON DREIZEHN ADRIATISCHEN BLENNIIDEN (TELEOSTEI, PERCIFORMES). [MORPHOLOGY OF THE TEETH AND FOOD PREFERENCES OF THIRTEEN SPECIES OF ADRIATIC BLENNIES (TELEOSTEI, PERCIFORMES).] *Zool. Scr.* 9(1):67-78. 1980. In German with English summ. SFA 25(4)
[Zool. Inst., Univ. Salzburg, Austria]

80-002804 Gorelova, T. A. THE FEEDING OF THE YOUNG OF SOME HOLOEPIPELAGIC FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):49-57. 1979. SFA 25(4)
[P. P. Shirshov Inst. Oceanol., USSR Acad Sci., (IOAN), Moscow, USSR] The feeding spectra of the young of *Nomeus albula*, *Naucrates ductor*, *Coryphaena hippurus*, and *C. equisetis* caught in the tropical part of the Pacific are examined. The main food items of *N. albula* and *N. ductor* are Cyclopoida and the copepodite stages of Calanoida. These species feed only during the day. The young of the dolphin feed mainly on hyponeuston

FOODS/FEEDING (CONTINUED)

80-002804 CONTINUED crustaceans of the family Pontellidae. Food capture takes place round the clock, but less intensively at night.

80-002805 Grabe, S. E. FOOD OF AGE 1 AND AGE 2 ATLANTIC TOMCOD, *MICROGADUS TOMCOD*, FROM HAVERSTRAW BAY, HUDSON RIVER, NEW YORK. *NOAA Fish. Bull.* 77(4):1003-1006. 1980. SFA 25(4)
[Normandeau Assoc., Inc., 15 Pickering Ave., Portsmouth, NH 03801]

80-002806 Hanson, J. M. and S. U. Qadri. MORPHOLOGY AND DIET OF YOUNG-OF-THE-YEAR BURBOT, *LOTA LOTA*, IN THE OTTAWA RIVER. *Can. Field-Nat.* 94(3):311-314. July-Sept. 1980. SFA 25(4)
[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada] In August and September 1979, 41 young-of-the-year Burbot, *Lota lota*, were collected with a D.C. electrofisher in shallow water of the Ottawa River, near Ottawa, Ontario. The fish provide the second record of capture of young Burbot in eastern Canada outside of the Great Lakes. Head length was significantly longer and the first dorsal fin length, preanal length, postpectoral length, and predorsal length were shorter for juvenile Burbot compared to adults. The anal fin was white with a thin black edge and the pectoral fin rays were black. Young Burbot attained a mean total length of 87.3 mm and weighed 5.6 g in August and were an average of 102.9 mm long and weighed 7.6 g in September. The length-weight relationship was log WT=2.579 log TL - 4.299. Amphipods were the most important food item but 28.6% of the young Burbot ate darters (*Etheostoma* spp.) in September.

80-002807 Hofer, R. and R. Niederholzer. THE FEEDING OF ROACH (*RUTILUS RUTILUS* L.) AND RUDD (*SCARDINIUS ERYTHROPHTHALMUS* L.) II. FEEDING EXPERIMENTS IN THE LABORATORY. *Ekol. Pol.* 28(1):61-70. 1980. In English with Polish summ. SFA 25(4)
[Inst. Zool., Univ. Innsbruck, Peter-Mayr-Str. 1a, A-6020 Innsbruck, Austria] The daily relative consumption and the relative gut content at four temperatures and four diets applied in roach and rudd were studied. The daily relative consumption of filamentous algae and meal worms was below 8%, whereas maximum values up to 40% were obtained when food consisted of *Chara* or *Zannichellia*. These results were used for calculating the intestinal passage rate and the real activity of digestive enzymes in phytophagous fish. At a temperature range between 16 and 24°C the intestinal passage rate decreases with increasing consumption from about 9 hours to a minimum of 2-3 hours.

80-002808 Imabayashi, H. [FEEDING ACTIVITIES OF JUVENILE AND YOUNG BASTARD HALIBUT, *PARALICHTHYS OLIVACEUS*, IN THE BIOTIC COMMUNITY--I. INTRASPECIFIC RELATIONSHIPS IN THE POPULATION. *Bull. Jpn. Soc. Sci. Fish.* 46(4):427-435. Apr. 1980. In Japanese with English summ. SFA 25(4)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan] The intraspecific relationships within the juvenile and young bastard halibut have been studied in a growing area in the Genkai-Nada at approximately monthly intervals during 1976 and 1977, based on the stomach contents examined. At a depth of 5 m, many halibut under 120 mm in total length were found in May to October, feeding mainly on Mysidacea. At a depth of 5 m in 1976, change of the abundance of the halibut, change of the abundance of Mysidacea in the benthos fauna, and change of the amount of Mysidacea in the stomach of the halibut generally showed similar trends. In July to September, the amount of Mysidacea in the stomach decreased extremely accompanied by the following phenomena: (i) fall of the index of stomach fullness, (ii) difference of the stomach contents between small-sized fish and large-sized ones.

FOODS/FEEDING (CONTINUED)

80-002809 Kazanskiy, A. B. A MODEL OF THE TROPHIC NETWORK OF THE TSIMLYANSK RESERVOIR ICHTHYOCENOSIS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):86-91. 1979. SFA 25(4)

A mathematical, computer-produced model of the trophic network of the Tsimlyansk ichthyocenosis is submitted. A method of analyzing intrapopulation trophic relationships in a fish community by means of matrices of paired coupling coefficients is studied on the model and the method of modeling interrelationships between predators and prey is more accurately defined. The model is considered as a preparatory stage in the creation of a dynamic model of the Tsimlyansk reservoir ichthyocenosis.

80-002810 Keenan, C. L. and T. Miller. POPULATION RESPONSES OF *HYALELLA AZTECA* IN THE COLORADO RIVER TO PERIPHYTON STANDING CROP AND PREDATION BY THE RAZORBACK SUCKER (*XYRAUCHEN TEXANUS*). *Bull. Ecol. Soc. Am.* 61(2):52. June 1980. Abstract only. SFA 25(4)

[Univ. Nev., Las Vegas] Periphyton and benthic invertebrates were sampled at three discrete depths in the Colorado River 1.2 km below Hoover Dam. Numbers and biomass of *Hyalella azteca* were found to vary greatly at the three sampling areas. The largest numbers and biomass occurred on a shallow sand and cobble reef. Population size in mid-channel varied greatly with time due to the highly unstable nature of the substrate, which ranged from large to very small cobble and sand. The other area sampled in the channel consisted of large cobble and boulders. Numbers were high in this area, but the size of individuals was greatly reduced in these sites. Numbers of individuals at all three locations were correlated with periphyton standing crop. Observations of the razorback sucker revealed this fish to selectively inhabit the deeper portions of the river. The smaller size of amphipods in the deeper areas may be due not only to food availability, but also to selective predation by the razorback sucker.

80-002811 Kohler, C. C. and J. J. Ney. PISCIVORITY IN A LAND-LOCKED ALEWIFE (*ALOSA PSEUDOHARENGUS*) POPULATION. *Can. J. Fish. Aquatic Sci.* 37(8):1314-1317. Aug. 1980. In English with French summ. SFA 25(4)

[Fish. Res. Lab., South. Ill. Univ., Carbondale 62901]

80-002812 Kokes, J. THE FOOD EATEN BY THE FRY OF CHUB, *LEUCISCUS CEPHALUS*, IN THE ROKYTNÁ RIVER. *Folia Zool.* 28(4):361-370. 1979. SFA 25(4)

[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia] The food eaten by the chub fry in the Rokytná River consisted mainly of animal items. Of greatest importance were chironomid larvae which, during certain months, were supplemented or replaced by other items, above all, mayfly larvae and caddis worms. The chub fry subsisted mainly on aquatic organisms; terrestrial ones constituted only supplementary food; and the vegetable component was neglibible. The variation in trophic diversity showed a marked maximum in August and September, and a marked minimum in January. Chub fry of all size groups consumed almost identical diets. However, there were differences in the index of fulness which attained considerably higher values in the smallest fish examined in June than in bigger fish during the remaining months.

80-002813 Koslow, J. A. THE FEEDING OF SCHOOLS OF NORTHERN ANCHOVY (*ENGRAULIS MORDAX*), AND COMMUNITY STRUCTURE AND DIURNAL MIGRATORY BEHAVIOR IN MARINE ZOOPLANKTON. *Ph.D. dissertation, Univ. Calif. (San Diego)* 227p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):777. Sept. 1980. SFA 25(4)

80-002814 Maeda, T.; T. Takahashi and M. Ueno. [ECOLOGICAL STUDIES ON THE ALASKA POLLACK IN THE ADJACENT WATERS OF THE FUNKA BAY, HOKKAIDO--IV. SEASONAL VARIATIONS OF ZOOPLANKTON DISTRIBUTION IN FOOD FOR THE ALASKA

FOODS/FEEDING (CONTINUED)

80-002814 CONTINUED POLLACK.] *Bull. Jpn. Soc. Sci. Fish.* 46(6):671-674. June 1980. In Japanese with English summ. SFA 25(4)
[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan]

80-002815 Mallatt, J. M. MECHANISM AND REGULATION OF FEEDING IN THE LARVAL LAMPREY *PETROMYZON MARINUS*. *Ph.D. dissertation, Univ. Chicago* 1980. From Diss. Abstr. Int. B Sci. Eng. 41(1):26. July 1980. SFA 25(4)

80-002816 Meyer-Rochow, V. B. STOMACH AND GUT CONTENTS OF *CARAPUS MOURLANI* FROM STARFISH AND A HOLOTHURIAN. *Ann. Zool. Fenn.* 16(4):287-289. 1980. SFA 25(4)
[Dep. Biol. Sci., Univ. Waikato, Hamilton, New Zealand] No echinoderm tissue was found in any of the eight fish recovered from coelomic cavities of cushion starfish, but the intestine of the fish contained well-digested traces of crustacean material. Of the seven fish collected from a holothurian host species, five had empty stomachs, but two contained semi-digested parts of a small brachyuran crab and a small carapid fish, whose position in the stomach indicated that it had entered tail first. The guts of all specimens contained fragments of crustacean material, bristles (probably of polychaete origin) and an amorphous orange substance. Although the results do not completely rule out parasitism for *C. mourlani*, it seems likely that both nocturnal foraging and the habit of residing inside echinoderms and other suitable hosts have evolved primarily as means for obtaining protection from diurnal predators and that any possible parasitic activity of the fish has evolved secondarily.

80-002817 Montgomery, W. L. COMPARATIVE FEEDING ECOLOGY OF TWO HERBIVOROUS DAMSELFISHES (POMACENTRIDAE: TELEOSTEI) FROM THE GULF OF CALIFORNIA, MEXICO. *J. Exp. Mar. Biol. Ecol.* 47(1):9-24. 14 Aug. 1980. SFA 25(4)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] Two species of benthic damselfishes from the Gulf of California, Mexico, use contrasting behaviors when feeding on benthic algal communities. The small (± 70 g) Cortez damselfish, *Eupomacentrus rectifraenum* (Gill, 1862), feeds selectively from a multi-species algal mat, eats fleshy red and green algae and ignores brown and calcareous algae. The giant blue damselfish, *Microspathodon dorsalis* (Gill, 1862), is a large (± 450 g), lethargic, nonselective feeder which grazes on a near monoculture of a fleshy red alga, *Polysiphonia* sp. Feeding activity for both species is low in the morning, peaks during late afternoon, and drops sharply as night approaches. Based on feeding rates, gut-filling times, and weights of gut contents, Cortez damselfish process six to eight full guts of food and giant blue damselfish three full guts of food per day. The algal mat exhibits high standing crops (291-618 g dry wt/m^2) and low productivity, but the preferred food of the Cortez damselfish (*Ulva*) appears to colonize the mat frequently and grow rapidly. The *Polysiphonia* dominated community on giant blue damselfish territories exhibits low standing crops (23 g/m^2) and high productivity (34-47 times that of the mat per gram algae). Even though the feeding behaviors and resources used by the two damselfishes differ, both species eat similar foods (delicate red and green fleshy algae) and depend on rapid colonization and/or high productivity to maintain their primary foods in the grazed algal community.

80-002818 Niederholzer, R. and R. Hofer. THE FEEDING OF ROACH (*RUTILUS RUTILUS* L.) AND RUDD (*SCARDINIUS ERYTHROPHTHALMUS* L.). *Ekol. Pol.* 28(1):45-59. 1980. In English with Polish summ. SFA 25(4)
[Inst. Zool., Univ. Innsbruck, Peter-Mayr-Str. 1a, A-6020 Innsbruck, Austria] The influence of season and temperature on the feeding behaviour of roach and rudd in four Tyrolean lakes was studied. Both species are

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80-002818 CONTINUED characterized by a heterogeneous diet. In roach feeding is strongly affected by temperature, whereas in rudd no effect of season or temperature could be observed.

80-002819 Ormond, R. F. G. AGGRESSIVE MIMICRY AND OTHER INTERSPECIFIC FEEDING ASSOCIATIONS AMONG RED SEA CORAL REEF PREDATORS. *J. Zool. (Lond.)* 191(2):247-262. June 1980. SFA 25(4)
[Dep. Biol., Univ. York, York, England] A description is given of the range of interspecific feeding associations used by fish predators on a coral reef in the Sudanese Red Sea. The types of association observed are classified as (i) following and scavenging, (ii) hunting by "riding", (iii) hunting by aggressive mimicry and (iv) joint hunting. In particular quantitative accounts are given for previously undescribed examples of the use of riding by *Diploprion drachi* and *Chellinus diagrammus*, and of the use of aggressive mimicry by *Chellinus diagrammus* and *Ephibulus insidiator*. These two examples of aggressive mimicry involve colour change by the mimic which then associates with the species which it is mimicking. The frequency of the occurrence of joint hunting involving *Gomphosus caeruleus* and *Parupeneus chryseredros* or *P. macronema* is also described. In all, 24 species of predator were observed involved in one or more of these forms of feeding assocation. It is noted that some of these predators make use of these associations very frequently during feeding, and that they may associate with a selection of other species depending on their availability.

80-002820 Perrin, J. F. STRUCTURE ET FONCTIONNEMENT DES ECOSYSTEMS DU HAUT-RHONE FRANCAIS. 14-ETUDE DES PREFERENCES ALIMENTAIRES DE LA LOCHE FRANCHE (*NOEMACHEILUS BARBATULUS* L.) PAR UNE METHODE DES POINTS MODIFIEE. [STRUCTURE AND FUNCTION OF ECOSYSTEMS OF THE FRENCH UPPER RHONE. 14. STUDY OF FEEDING PREFERENCES OF THE STONE LOACH (*NOEMACHEILUS BARBATULUS* L.) WITH A MODIFIED POINT METHOD.] *Hydrobiologica* 71(3):217-224. 20 June 1980. In French with English summ. SFA 25(4)
[Dep. Biol. Anim. Zool., Univ. Lyon I, 69621 Villeurbanne, France] A method for analyzing the digestive contents of fishes, derived from Hynes' points method (1950) is described here and applied to the study of the diet of the stone loach populations, *Noemacheilus barbatulus*, from different biotopes of the Rhône river in France. Whatever the season or the location, the stone loach feeds mainly on larvae of Chironomids which are apparently captured by choice. Other insect larvae form a constant part of the ration but their abundance in the diet is under the dependence of an opportunistic feeding behaviour. Molluscs, Achaeta, Planaria and Oligochaeta, which are very common in the benthos, are never eaten. These preferences can be easily related to a particular trophic activity of the fish. They seem to be a specific and constant character of the biology of this very widely distributed species in all European running waters.

80-002821 Petersen, G. H. and M. A. Curtis. DIFFERENCES IN ENERGY FLOW THROUGH MAJOR COMPONENTS OF SUBARCTIC, TEMPERATE AND TROPICAL MARINE SHELF ECOSYSTEMS. *Dana* 1:53-64. 1980. SFA 25(4)
[Zool. Mus., Universitetsparken 15, 2100 Copenhagen Ø, Denmark] Biological production is estimated here for some major components of marine shelf ecosystems from subarctic, temperate and tropical areas (Disko Bugt, the North Sea, and Phangnga Bay, Thailand). Included are values for the production of phytoplankton and herbivorous zooplankton, the production of benthic deposit feeders and filter feeders at the compensation depth, and the yield to man of pelagic and demersal fish. Primary planktonic production increases from the subarctic to the topics, but the transfer of this energy to higher trophic levels appears most efficient in the high latitude ecosystem. Although the zooplankton comprises a dominant link within the tropical food web, energy flow in the subarctic may be more equally portioned between the benthos and the zooplankton. Consequently, pelagic organisms form

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80-002821 CONTINUED the basis for a fishery in the tropical study area while demersal forms are of greater importance in the subarctic. The existence of such fundamental differences in the structure of marine ecosystems implies that management models developed for temperate waters may sometimes require substantial modification to serve a useful purpose in subarctic or tropical waters.

80-002822 Reist, J. D. PREDATION UPON PELVIC PHENOTYPES OF BROOK STICKLEBACK, *CULAEA INCONSTANS*, BY SELECTED INVERTEBRATES. *Can. J. Zool.* 58(7):1253-1258. July 1980. In English with French summ. SFA 25(4)
[Dep. Ichthyol. Herpetol., Royal Ontario Mus., Toronto, ON M5S 2C6, Canada] Laboratory experiments investigated selective predation by aquatic insects upon phenotypes of brook stickleback (*Culaea inconstans*), *with* and *without* pelvises, from Wakomao Lake, Alberta, Canada. Predation by *Lethocerus americanus* (water bug) and nymphs of *Aeschna* spp. (dragonflies) was random upon each phenotype. Predation by the larvae of *Dytiscus* spp. (water beetle) resulted in significant selection for *with* individuals possessing five dorsal spines. The observed selection was at least partially due to closer approaches to the predator made by the *withs*. No selection occurred for either phenotype with six dorsal spines. This evidence supports an hypothesis that the pelvic variation is maintained by differential predation.

80-002823 Reist, J. D. SELECTIVE PREDATION UPON PELVIC PHENOTYPES OF BROOK STICKLEBACK, *CULAEA INCONSTANS*, BY NORTHERN PIKE, *ESOX LUCIUS*. *Can. J. Zool.* 58(7):1245-1252. July 1980. In English with French summ. SFA 25(4)
[Dep. Ichthyol. Herpetol., Royal Ontario Mus., Toronto, ON M5S 2C6, Canada] Laboratory and field work assessed the importance of *Esox lucius* predation in maintaining pelvic skeletal phenotypes in a population of *Culaea inconstans*. Individuals possessing a pelvis and pelvic spines (*with*) have a selective advantage over those lacking these parts (*without*). The latter are preferentially preyed upon in the lab by small northern pike due to this morphological difference. The advantage conferred by the spines depends upon relative size of predator to prey and likely has no effect upon predation by larger pike. Preferential selection of *with* individuals whose pelvic spines were removed, rather than *without* individuals (i.e. morphologically similar prey), suggests *withouts* compensate behaviourally for their morphological disadvantage. Analysis of food of large wild pike indicated that these postulated behavioural differences contributed to selective predation of individuals of the *with* phenotype in Wakomao Lake, Alberta, Canada. The frequency of these phenotypes in any situation represents a balance between counterselective forces, some of which are due to predation. Additional predatory species present in the lake and additional uses of pelvic spines probably also influence the phenotypic frequencies.

80-002824 Stiven, A. E. and R. T. Kneib. SOME RESPONSES OF THE SALT MARSH INFAUNAL AND EPIFAUNAL COMMUNITIES TO FISH PREDATION AND *SPARTINA* LITTER. *Bull. Ecol. Soc. Am.* 61(2):98. June 1980. Abstract only. SFA 25(4)
[Univ. N.C., Chapel Hill] Changes in the faunal communities of two different salt marshes were examined under differential regimes of killifish and blue crab predation and under varying levels of dead *Spartina* stem densities. Predation was manipulated by means of both enclosures and exclosures. The responses of several groups of the epifauna were conditioned by both time of year and by marsh. Predation produced the most notable effects in the polychaete taxa and the small gastropods with little effect on some of the arthropod groups. A reduction of the standing *Spartina* litter caused declines in larger polychaetes and ostracods. Size-specific predation by killifishes also produced significant responses in a variety of benthic infauna, especially small polychaetes and crustaceans. Interactions between vertebrate and invertebrate predators may condition some of the responses of the benthic faunal assemblages.

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80-002825 Taylor, W. W. and S. D. Gerking. POPULATION DYNAMICS OF *DAPHNIA PULEX* AND UTILIZATION BY THE RAINBOW TROUT *(SALMO GAIRDNERI)*. *Hydrobiologia* 71(3):277-287. 20 June 1980. SFA 25(4)

[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824] The effect of rainbow trout (*Salmo gairdneri*) predation on the population dynamics of the water flea, *Daphnia pulex*, was examined during 1976 and 1977 in Becker Lake, a small, shallow, productive reservoir in northeastern Arizona. Rainbow trout were size-biased feeders, utilizing daphnids which were 1.3 mm in size or larger. Trout predation upon *Daphnia pulex* occurred mainly during winter and early spring when their numbers were relatively low but their clutch size high, suggesting that trout selected *Daphnia* on the basis of brood pigmentation. By far the greatest proportion of *Daphnia* mortality was due to nonpredatory sources, since generally less than 6% could be attributed to trout predation. The *D. pulex* population exhibited a bimodal seasonal abundance curve which was attributed to ephippial egg production and trout predation during the winter and poor food quality/quantity during the summer.

80-002826 Walters, L. L. and E. F. Legner. IMPACT OF THE DESERT PUPFISH, *CYPRINODON MACULARIUS*, AND *GAMBUSIA AFFINIS AFFINIS* ON FAUNA IN POND ECOSYSTEMS. *Hilgardia* 48(3):1-18. Feb. 1980. SFA 25(4)

[Dep. Entomol., Univ. Calif., Davis] Effects of populations of *Cyprinodon macularius* Baird and Girard (desert pupfish) and *Gambusia affinis affinis* (Baird and Girard) on aquatic insects and zooplankton were investigated in shallow ponds clear of emergent vegetation and those planted with rice. Presence of both fish caused equivalently lower densities of beneficial insect predators, mosquitoes, and zooplankton. Except for some behavioral feeding differences, food consumption appeared to be related to the density of food organism available. *Cyprinodon macularius* foraged primarily in the benthos, where it consumed chironomid midge larvae, aquatic vegetation, snails, detritus, and some zooplankton and insect predator groups; whereas, *G. affinis*, foraging more at the surface, consumed a diverse selection of terrestrial insects as well as chironomid midge larvae, more planktonic zooplankters, snails, and some insect predators. *Cyprinodon macularius* appears to be an acceptable substitue for *G. affinis* in mosquito control, and may be preferred in habitats harboring other native fishes due to minimal piscivorous behavior.

80-002827 Werner, R. G. and J. H. S. Blaxter. GROWTH AND SURVIVAL OF LARVAL HERRING (*CLUPEA HARENGUS*) IN RELATION TO PREY DENSITY. *Can. J. Fish. Aquatic Sci.* 37(7):1063-1069. July 1980. SFA 25(4)

[Dep. Environ. For. Biol., SUNY Coll. Environ. Sci. For., Syracuse 13210]

80-002828 Yermolin, V. P. THE INFLUENCE OF PREDATORS ON THE FISH POPULATION IN SARATOV RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):81-85. 1979. SFA 25(4)

[Saratov Dep., State Res., Inst. Lake River Fish., USSR] In Saratov reservoir predators consumed fish up to 30 cm long. Predator effect was greatest on prey less than 10-15 cm long. With the increase in the size of prey the degree of predation decreased. The young of the silver carp, bighead and black carp should be 20.0-22.5 cm long and weigh 200-220 g when released into Saratov reservoir.--Concl.

80-002829 Yoshiyama, R. M. FOOD HABITS OF THREE SPECIES OF ROCKY INTERTIDAL SCULPINS (COTTIDAE) IN CENTRAL CALIFORNIA. *Copeia* 1980(3):515-525. 6 Sept. 1980. SFA 25(4)

[Environ. Sci. Div., Oak Ridge Natl. Lab., P.O. Box X, Oak Ridge, TN 37830] Food habits of three intertidal sculpins--*Oligocottus snyderi*, *Cinocottus analis* and *Artedius lateralis*--were determined from examination of

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80-002829 CONTINUED stomach contents. *C. analis* had the most diverse diet. *O. snyderi* and *A. lateralis* had roughly similar levels of diversity in their diets, although they concentrated on different food items (*O. snyderi* on amphipods and polychaetes, and *A. lateralis* on shrimp and fishes). There were no statistical differences in diet composition between large and small fish within species. Size classes of *C. analis* had the greatest average diversity of food while size classes of *A. lateralis* had the lowest average diversity. *O. snyderi*, the smallest species, generally took the smallest prey while *A. lateralis*, the species with the largest gape, took the largest prey. Variation in prey size was smallest for *O. snyderi* and largest for *A. lateralis*. Much of the variation in prey sizes eaten by each species was due to the large average variation in prey sizes eaten by individual size classes. Information on food habits is combined with earlier data on intertidal distributions of the fishes. Differences among species in the use of food and space resources are viewed as a way for species to minimize, and as a possible result of, compeition. Some degree of complementarity in use of resource dimensions (tidepool category, food category, prey size) also indicates that competition may have influenced patterns of resource use shown by these fishes.

AGE AND GROWTH

80-002830 Baglin, R. E., Jr. LENGTH-WEIGHT RELATIONSHIPS OF WESTERN ATLANTIC BLUEFIN TUNA, *THUNNUS THYNNUS*. *NOAA Fish. Bull.* 77(4):995-1000. 1980. SFA 25(4)
[NMFS, P.O. Box 686, Kodiak, AK 99615]

80-002831 Borets, L. A. THE POPULATION STRUCTURE OF THE BOARFISH, *PENTACEROS RICHARDSONI*, FROM THE EMPEROR SEAMOUNTS AND THE HAWAIIAN RIDGE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):15-20. 1979. SFA 25(4)
[TINRO, Vladivostok, USSR]

80-002832 Bruton, M. N. and B. R. Allanson. GROWTH OF *CLARIAS GARIEPINUS* IN LAKE SIBAYA, SOUTH AFRICA. *S. Afr. J. Zool.* 15(1):7-15. 1980. In English with Afrikaans summ. SFA 25(4)
[Inst. Freshwater Stud., Rhodes Univ., Grahamstown, South Africa] Pectoral spines from 750 *Clarias gariepinus* (Pisces: Clariidae) from Lake Sibaya were used for age and growth determinations. The spines have clear rings in the bone matrix. Rings formed on otoliths, vertebrae and opercula were less useful. A close correlation between ages determined from length frequency data and ages obtained by back-calculation of lengths for different ring classes exists. Spine rings are laid down annually, except in the first year. *C. gariepinus* in Lake Sibaya grow rapidly and remain in good condition to a length of about 500 mm (age 3+ years) but of the larger catfish, few exceed 650 mm (7+ years). Males growth slightly faster than females, and modal sizes are 580-590 mm TL, and 540-550 mm TL. Over one third of the adult population measures between 500 and 600 mm TL due to the sharp deceleration of growth rate after 500 mm TL. Modal length and growth rate of Sibaya catfish is equal to that of other *C. gariepinus* populations, but the number and condition of larger individuals is lower, probably because of inadequate food resources in deep water.

80-002833 Crivelli, A. THE EYE LENS WEIGHT AND AGE IN THE COMMON CARP, *CYPRINUS CARPIO* L. *J. Fish Biol.* 16(5):469-473. May 1980. SFA 25(4)
[Stn. Biol. Tour Valat, Le Sambuc, F-13200 Arles, France] The validity of

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80-002833 CONTINUED the use of the weight of dried eye lenses as an indicator of age in the common carp, *Cyprinus carpio* L., is tested. There is a significant difference between males and females for fish of two and three years old. Otherwise no significant difference is noted between sexes. The linear relationship between the dry weight of eye lenses and age +1 are: $\ln Y + 1 = 0.5202 + 16.4928X$ ($r=0.93$) for female and $\ln Y + 1 = 0.4276 + 16.7364X$ ($r=0.94$) for male. The method for determining age is valuable for fish until three years old. However for older fish, in spite of a correlation coefficient between lens weight and age and even with a significant difference between annual groups, the age determination may be misleading due to the overlap in lens weights. In conclusion therefore this method may not be useful for back calculation of growth, for production estimates or studies in which accurate estimates of age are needed.

80-002834 Duncan, T. O. and M. R. Myers, Jr. LONGEVITY OF WHITE BASS IN BEAVER RESERVOIR, ARKANSAS. *Proc. Ark. Acad. Sci.* 32:87-88. 1978. SFA 25(4)
[U.S. FWS, Arkadelphia, AR 71923]

80-002835 Fagade, S. O. THE MORPHOLOGY OF THE OTOLITHS OF THE BAGRID CATFISH, *CHRYSICHTHYS NIGRODIGITATUS* (LACEPEDE) AND THEIR USE IN AGE DETERMINATION. *Hydrobiologia* 71(3):209-215. 20 June 1980. SFA 25(4)
[Dep. Zool., Univ. Ibadan, Nigeria] Two pairs of otoliths, the saccular and sagittae are shown to be well developed in the catfish, *Chrysichthys nigrodigitatus*. The gross morphology of each pair is provided. Growth markings arranged in a periodic manner are demonstrated. In addition, daily growth marks are shown to be present. The growth markings on the sagittae are interpreted and used in estimating the age and growth of the species.

80-002836 Heisey, P. G.; D. Mathur and N. C. Magnusson. ACCELERATED GROWTH OF SMALLMOUTH BASS IN A PUMPED STORAGE SYSTEM. *Trans. Am. Fish. Soc.* 109(4):371-377. July 1980. SFA 25(4)
[Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

80-002837 Kilambi, R. V. and W. R. Robison. AGE AND GROWTH OF CARP FROM BEAVER RESERVOIR, ARKANSAS. *Proc. Ark. Acad. Sci.* 32:91-92. 1978. SFA 25(4)
[Dep. Zool., Univ. Ark., Fayetteville 72701]

80-002838 Kimura, D. K. LIKELIHOOD METHODS FOR THE VON BERTALANFFY GROWTH CURVE. *NOAA Fish. Bull.* 77(4):765-776. 1980. SFA 25(4)
[Wash. Dep. Fish., Olympia 98504] Liklihood methods for the von Bertalanffy growth curve are examined under the assumption of independent, normally distributed errors. The following are examined: determining the best method of estimation, relationships between methods of estimation, failure of assumptions, constructing confidence regions, and applying likelihood ratio tests. An example is presented illustrating many of the methods discussed in theory. The paper may be viewed as an application of classic nonlinear least squares methods to the von Bertalanffy curve. As such, the concepts discussed are generally applicable and the paper may serve as an introduction to nonlinear least squares.

80-002839 Radtke, R. L. and K. G. Waiwood. OTOLITH FORMATION AND BODY SHRINKAGE DUE TO FIXATION IN LARVAL COD (*GADUS MORHUA*). *Can. Tech. Rep. Fish. Aquatic Sci.* No. 929. iii + 10p. June 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada] Daily increments were found to develop in the otoliths of larval cod with the first

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80-002839 CONTINUED increment formed the day after hatching. Scanning electron microscope data pointed to the formation of a "metamorphic" check that occurred at the time of yolk-sac absorption. With this information it might be possible to accurately age and determine the growth of this important commercial fish species. Fixation of reared cod larvae in ethanol resulted in body shrinkage which was dependent upon the age of the larvae and independent of the time of death. These data give a strong alternative to formalin fixation.

80-002840 Stanley, C. A. LEE'S PHENOMENON IN THE WESTERN SUBSPECIES OF THE AUSTRALIAN SALMON, *ARRIPIS TRUTTA ESPER*. *Aust. J. Mar. Freshwater Res.* 31(1):13-19. Mar. 1980. SFA 25(4)
[Div. Fish. Oceanogr., CSIRO, P.O. Box 21, Cronulla, N.S.W. 2230, Australia] Lee's phenomenon is apparent in scale readings of the western subspecies of *A. trutta esper.* A hypothesis involving a progressive eastward decrease in growth rate of fish from juvenile areas coupled with the progressive entry of these fish into the adult fishing area is advanced to explain the appearance of the phenomenon. The phenomenon can be included under the effects of biased sampling, although not in the normally accepted sense. Here it is apparently caused in the adult fishery by the selective arrival of fish with progressively slower growth rates, and in juvenile areas by the selective departure of faster-growing fish. If the hypothesis is correct this type of situation may occur in other species exhibiting a cline in growth rate that migrate from nursery areas to a separate spawning or adult area.

80-002841 Steffensen, E. DAILY GROWTH INCREMENTS OBSERVED IN OTOLITHS FROM JUVENILE EAST BALTIC COD. *Dana* 1:29-37. 1980. SFA 25(4)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] Difficulties in age determination of adult cod from the Baltic east of Bornholm by means of their otoliths were the reason for beginning this study. As especially there is some doubt regarding the growth within the first year of life the work is entirely concerned with young cod. Thin sections of otoliths from juvenile cod showed a number of uniform growth zones each of which seems to correspond to daily growth. The number of growth zones were counted in order to establish the approximate birthdate for each cod. These dates were in some cases different from the known spawning period by possibly a few weeks suggesting that an unknown number of growth zones in the central part of the otolith have escaped detection and that the methods ought to be improved.

80-002842 Sugiwaka, K. and H. Kojima. [STUDIES ON THE SMOLT OF JUVENILE MASU SALMON (ONCORHYNCHUS MASOU) IN THE ATSUTA RIVER. AGE AND ECOLOGY OF SMOLTS IN 1978.] *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 25-39. Dec. 1979. In Japanese with English summ. SFA 25(4)
[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan] The ecological investigations on the sea-run form (smolt) of juvenile Masu salmon were carried out in the Atsuta River in mid-April and mid-May of 1978, and remarkable findings on the age of smolt were procured. The method of age determination in this study was as follows; in number of ridges from central plate on sclaes, the most outside ridge of annulus ranging between 5 and 9 was regarded as the simulate annulus, while ranges from 10 to 18 and 20 to 27 were regarded as the actual first and second annulus, respectively. According to the literatures, it has been described that the greater part of smolt of juvenile Masu salmon observed in the rivers and the coast of the North Japan were 1-year-old (2_2) but 2-year-old (3_3) smolt occupied only 2 or 3 per cent in the frequency. But in the Atsuta River, the frequency of 2-year-old smolt was markedly high (41.3 per cent). The numerical difference of the frequency of 2-year-old smolt in this study and in the other reports can not be explained clearly at present. Some reasons for this difference, however, were considered: 1) selectivity to fish of sampling method (angling), 2) difference of the age determination method, 3)

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80-002842 CONTINUED difference of locality. Several 1-year-old small parr which commenced neither phase differentiation nor smolt transformation were found, and it is considered that these small parr will differentiate into 2-year-old smolt or stream resident parr by next spring. The 2-year-old smolt examined exhibited characteristics suggesting a high degree of inferior growth during the period of one year after hatching. Hence, if the emergence of 2-year-old smolt depends on inferiority of growth, it is supposed that its frequency may fluctuate yearly, because it must be influenced by the environment of the river, especially, the amount of feed, the number of anadromous adults, and the individual density of parr in the river.

80-002843 Swanson, R. D. AGING LONGNOSE SUCKERS (*CATOSTOMUS CATOSTOMUS*) A COMPARISON OF METHODS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:96-97. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901] Abstract only. SFA 25(4)

[Dep. Biol., Univ. Wyo., Laramie] Age and back-calculated growth rates were determined using scales, pectoral fin-ray sections, and opercles taken from 326 longnose suckers. Fin-ray sections proved to be the most accurate in assessing age and growth rates. Results from opercles generally agreed with those from fin rays, although the opercle results consistently underestimated the age by one year. Ages as assessed using fin rays and opercles indicated extremely slow growth and long-lived fish (24 years). Ages assessed by scales indicated moderate growth rates and a maximum life of eight years. Data from tagged fish and observed growth rates of 0+ fish indicate that the fin-ray section method was the most accurate method examined.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

80-002844 Bath, H. *OMOBRANCHUS PUNCTATUS* (VALENCIENNES 1836) NEU IM SUEZ-KANAL. [*OMOBRANCHUS PUNCTATUS* (VALENCIENNES 1836) NEW IN THE SUEZ CANAL.] *Senckenbergiana Biol.* 60(5/6):317-319. 1979. In German with English summ. SFA 25(4)

[Luisenstr. 45, D-6780 Pirmasens, West Germany]

80-002845 Blaber, S. J. M. FISH OF THE TRINITY INLET SYSTEM OF NORTH QUEENSLAND WITH NOTES ON THE ECOLOGY OF FISH FAUNAS OF TROPICAL INDO-PACIFIC ESTUARIES. *Aust. J. Mar. Freshwater Res.* 31(2):137-146. Apr. 1980. SFA 25(4)

[Dep. Zool., Univ. Natal, P.O. Box 375, Pietermaritzburg, Natal 3200, South Africa] The fish faunas of tropical Trinity estuary and adjacent Trinity Bay are described. The fauna of the estuary is compared with that of other tropical Indo-Pacific estuaries and is found to be similar: all are dominated by juvenile marine fish. Numbers of planktivores are high and swimming prawns are an important food for many species. Absence of extensive shallow areas and a low biomass of benthic animals in Trinity estuary apparently limits the number of benthic feeding fish. Piscivores are few in the estuary and mainly represented by juvniles. Trinity Bay has fewer species represented by juveniles than the estuaries, higher numbers of piscivores, mainly adults, and fewer planktivores. The species diversity of Mugilidae in all areas is probably influenced by substrate diversity. Physical data indicate that substrate, turbidity and depth, together with relatively calm water in estuaries, affect the distribution of juvenile marine fish. If Trinity Bay is representative of areas of open water adjacent to tropical estuaries, the significantly lower numbers of piscivores in the estuaries may increase their advantage as sanctuaries for juvenile fish.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002846 Burr, B. M. A DISTRIBUTIONAL CHECKLIST OF THE FISHES OF KENTUCKY. *Brimleyana* No. 3. p. 53-84. July 1980. SFA 25(4)
[Dep. Zool., South. Ill. Univ., Carbondale 62901] A compilation of records of fishes from Kentucky waters based on specimens depositied in museums, personal collecting, and accepted literature reports revealed that 229 species occur or did occur in the state. A substantial amount of new distributional data is presented in the form of an annotated list including records of several species of fishes previously unreported from the state. Distributional statements in the checklist are based on individual spot maps completed for all Kentucky fishes. A list of five problematical species is included at the end of the checklist.

80-002847 Burr, B. M. and R. L. Mayden. DISPERSAL OF RIANBOW SMELT, *OSMERUS MORDAX*, INTO THE UPPER MISSISSIPPI RIVER (PISCES: OSMERIDAE). *Am. Midl. Nat.* 104(1):198-201. July 1980. SFA 25(4)
[Dep. Zool., South. Ill. Univ., Carbondale 62901] Three recent winter collections of *Osmerus mordax* from the Mississippi River, Illinois, document for the first time the presumed natural occurrence of the species outside the Great Lakes watershed. *Osmerus mordax* probably used the Chicago Canal-Illinois River connection to disperse into the Mississippi River. Examination of meristic characters indicated that the Mississippi River records are referable to the nominal *O. m. mordax*, the form originally introduced into the Great Lakes.

80-002848 Bussing, W. A. and M. I. López S. *GUENTHERUS ALTIVELA* OSORIO, THE FIRST ATELEOPODID FISH REPORTED FROM THE EASTERN PACIFIC OCEAN. *Rev. Biol. Trop.* 25(2):179-190. Dec. 1977. SFA 25(4)
[Esc. Biol., Univ. Costa Rica, Costa Rica]

80-002849 Dewey, M. R. and T. E. Moen. FISHES OF THE CADDO RIVER, ARKANSAS AFTER IMPOUNDMENT OF DEGRAY LAKE. *Proc. Ark. Acad. Sci.* 32:39-42. 1978. SFA 25(4)
[U.S. FWS, Multi-Outlet Reservoir Stud., Arkadelphia, AR 71923]

80-002850 Gilligan, M. R. THE ISLAND AND MAINLAND BIOGEOGRAPHY OF RESIDENT ROCKY-SHORE FISHES IN THE GULF OF CALIFORNIA. *Ph.D. dissertation, Univ. Ariz.* 150p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(2):452. Aug. 1980. SFA 25(4)

80-002851 Golovan', G. A. and N. P. Pahkorukov. A CATCH OF *ACANTHONUS ARMATUS* (FAMILY BROTULIDAE) OFF THE COAST OF NORTH-WEST AFRICA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):142-143. 1979. SFA 25(4)
[SEKBP, Sevastopol, USSR]

80-002852 Harris, J. L. and N. L. Douglas. FISHES OF THE MOUNTAIN PROVINCE SECTION OF THE OUACHITA RIVER. *Proc. Ark. Acad. Sci.* 32:55-59. 1978. SFA 25(4)
[Dep. Zool., Univ. Tenn., Knoxville 37916]

80-002853 Ivankov, V. N. and A. Ye. Samylov. FISH SPECIES NEW TO THE WATERS OF THE USSR AND THE PENETRATION OF WARMWATER FISHES INTO THE NORTHWESTERN SEA OF JAPAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):147-148. 1979. SFA 25(4)
[Dep. Ichthyol. Hydrobiol., Far East. Univ., Vladivostok, USSR]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002854 Knox, R. F. COLORADO'S NONGAME FISHES. TIME FOR REVIEW. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:95-96. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[Colo. Div. Wildl., Denver 80216] Recent fisheries surveys funded by the Colorado Division of Wildlife's Nongame Program have clarified the status of several species of threatened or endangered fishes. Information on Colorado River fishes, Cutthroat Trout, and Eastern Plains fishes will be briefly reviewed. The status of the nongame funding base, the income tax check-off fund, and the aquatic portion of the Nongame Program (approximately 25% of the total) will also be discussed. The possibilities for future recovery efforts and priorities in nongame aquatics, including the species listing procedures will be opened for discussion.

80-002855 Kojima, H. and T. Hikita. [FIRST OCCURRENCE OF ABURAHAYA, *PHOXINUS LAGOWSKI* F. *STEINDACHNERI*, IN HOKKAIDO.] *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 57-61. Dec. 1979. In Japanese with English summ. SFA 25(4)

[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

80-002856 Kristensen, J. LARGE FLATHEAD CHUB (*PLATYGOBIO GRACILIS*) FROM THE PEACE-ATHABASCA DELTA, ALBERTA, INCLUDING A CANADIAN RECORD. *Can. Field-Nat.* 94(3):342. July-Sept. 1980. SFA 25(4)

[LGL Ltd., Environ. Res. Assoc., 10110-124 St., Edmonton, AB T5N 1P6, Canada]

80-002857 Maret, T. R. and E. J. Peters. THE FISHES OF SALT CREEK BASIN, NEBRASKA. *Trans. Nebr. Acad. Sci.* 8:35-54. 1980. SFA 25(4)

[Dep. Environ. Control, Lincoln 68508]

80-002858 Margulies, D.; O. S. Burch and B. F. Clark. REDISCOVERY OF THE GILT DARTER (*PERCINA EVIDES*) IN THE WHITE RIVER, INDIANA. *Am. Midl. Nat.* 104(1):207-208. July 1980. SFA 25(4)

[Dep. Mar.-Estuar.-Environ. Sci., Univ. Md., College Park 20742]

80-002859 Matarese, A. C. and D. L. Stein. ADDITIONAL RECORDS OF SCULPIN *PSYCHROLUTES PHRICTUS* IN THE EASTERN BERING SEA AND OFF OREGON. *NOAA Fish. Bull.* 78(1):169-171. 1980. SFA 25(4)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

80-002860 Matthews, W. J. ADDITIONS TO THE FISH FAUNA OF PINEY CREEK, IZARD COUNTY, ARKANSAS. *Proc. Ark. Acad. Sci.* 32:92. 1978. SFA 25(4)

[Dep. Biol., Roanoke Coll., Salem, VA 24153]

80-002861 Robison, H. W. DISTRIBUTION AND HABITAT OF THE TAILLIGHT SHINER, *NOTROPIS MACULATUS* (HAY), IN ARKANSAS. *Proc. Ark. Acad. Sci.* 32:68-70. 1978.

[Dep. Biol. Sci., South. Ark. Univ., Magnolia 71753]

80-002862 Robison, H. W. and S. A. Winters. THE FISHES OF MORO CREEK, A LOWER OUACHITA RIVER TRIBUTARY, IN SOUTHERN ARKANSAS. *Proc. Ark. Acad. Sci.* 32:71-75. 1978. SFA 25(4)

[Dep. Biol. Sci., South. Ark. Univ., Magnolia 71753]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

80-002863 Rosen, D. E. FISHES FROM THE UPLANDS AND INTERMONTANE BASINS OF GUATEMALA: REVISIONARY STUDIES AND COMPARATIVE GEOGRAPHY. *Bull. Am. Mus. Nat. Hist.* 162(5):269-375. 1979. SFA 25(4)
[Dep. Ichthyol., Am. Mus. Nat. Hist., New York, NY]

80-002864 Shtundyuk, Yu. V. THE LAKE MINNOW, *PHOXINUS PERCNURUS*, - A NEW SPECIES IN THE ICHTHYOFAUNA OF THE ANADYR ZOOGEOGRAPHIC REGION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):151-154. 1979. SFA 25(4)
[Far East. Res. Cent., USSR Acad. Sci., Magadan, USSR]

80-002865 Tesch, F.-W. OCCURRENCE OF EEL *ANGUILLA ANGUILLA* LARVAE WEST OF THE EUROPEAN CONTINENTAL SHELF, 1971-1977. *Environ. Biol. Fishes* 5(3):185-190. 29 Sept. 1980. SFA 25(4)
[Biol. Anst. Helgo. (Zentr.), Palmaille 9, Hamburg 50, West Germany]

80-002866 Walker, S. R. DISTRIBUTION OF FISHES IN THIRTY-TWO MILE CREEK, NEBRASKA. *Trans. Nebr. Acad. Sci.* 8:91-98. 1980. SFA 25(4)
[Dep. For. Fish. Wildl., Univ. Nebr., Lincoln 68583]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

80-002867 Avery, E. L. FACTORS INFLUENCING REPRODUCITON OF BROWN TROUT ABOVE AND BELOW A FLOOD WATER DETENTION DAM ON TROUT CREEK, WISCONSIN. *Wis. Dep. Nat. Resour. Res. Rep.* 106. 26p. 1980. SFA 25(4)
[1206 Royalton, Waupaca, WI 54981] This study was initiated to determine the influence of a flood water detention dam upon the spawning environment and survival of brown trout eggs in Trout Creek, Wisconsin. Trout redds were counted above and below the detention dam during the fall of 1975, 1976, and 1977. Substrate compositon, intragravel temperatures, and intragravel dissolved oxygen (D.O.) were monitored in selected redds above and below the dam. Embryo development and survival were determined in each stream reach by excavating trout redds throughout the respective egg incubation periods. Stream temperature and discharge in each stream reach were also monitored. Brown trout spawning generally occurred from late October to mid-December and began 1 to 2 weeks earlier below the detention dam than above it. Each year, more than twice as many redds were constructed above the dam than below it. A higher incidence of superimposition and "false" redds occurred below the dam and was attributed to a lack of suitable spawning areas. The composition of redd material above and below the dam was not significantly different. Sedimentation of trout redds during the respective egg incubation periods could not be demonstrated. Embryo survival to hatching was positively correlated to stream temperatures and to a lesser extent, to intragravel D.O. concentration above 6 ppm. Stream temperatures and intragravel D.O. concentrations within redds were higher above the dam and resulted in significantly higher better overall survival to hatching than below the dam. An absence of heavy run-off and flooding during the 3 winters precluded any effect of the detention dam upon embryo survival, but the data provide a basis for future comparisons when winter flooding does occur.

80-002868 Febinger, D. L. EFFECTS OF WINTER CONDITONS ON FISH POPULATIONS IN LEFT-HAND CREEK, COLORADO: A PRELIMINARY REPORT. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:5-9. 1980. Available @$5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[841A 20th St., Boulder, CO 80302] Population dynamics and physiological changes of fishes in response to winter conditions are currently being investigated in a front range mountain stream to better understand causes of winter mortality. Two sections of Left-Hand Creek, Boulder County, Colorado are being studied. A lower, fourth order section, elevation 1850 m, average

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

80-002868 CONTINUED width 9.3m, had small late-autumn populations of stocked rainbow trout (43/surface ha), wild rainbow trout (215/surface ha) and longnose suckers (86/surface ha). A large brook trout population (3900/surface ha) made up of many small individuals was present at the upper, third order site, elevation 2400 m, average width 4.4 m. Biomass at the upper site (78 kg/surface ha) was 5.7 times that at the lower site (13.7 kg/surface ha). Stocked rainbow trout were in good condition (k=1.4) from October to February, fed actively and maintained a high fat wt/dry wt ratio (0.25). Brook trout were in poor condition in the fall (k=1.07), ate very little and showed a slight decline in condition through February (k=0.97). Greatest decline in condition occurred for longnose suckers with k going from 1.24 in October to 1.09 in February. Fat wt/dry wt for both brook trout and longnose suckers remained around 0.10. No significant change in fat content was observed for any species through February.

80-002869 Jackson, P. D. and W. D. Williams. EFFECTS OF BROWN TROUT, *SALMO TRUTTA* L., ON THE DISTRIBUTION OF SOME NATIVE FISHES IN THREE AREAS OF SOUTHERN VICTORIA. *Aust. J. Mar. Freshwater Res.* 31(1):61-67. Mar. 1980. SFA 25(4)

[Zool. Dep., Monash Univ, Clayton, Victoria 3168, Australia] Eight species of native fish and two of introduced fish were found during studies of the distribution of fishes in streams in three areas of southern Victoria, namely in the upper part of the catchment of the Yarra River, in the Otway Ranges, and on Wilsons Promontory. *S. trutta* does not occur on Wilsons Promontory but does occur in the other two areas. Results provide circumstantial evidence that *S. trutta* has deleteriously affected the occurence of *Galaxias olidus* and possibly *G. brevipinnis*. Some native fishes appear able to coexist with *S. trutta*.

80-002870 Naiman, R. J. DESERT FISHES AND THE AQUATIC HABITAT: AN ECOSYSTEM APPROACH. *Bull. Ecol. Soc. Am.* 61(2):104. June 1980. Abstract only. SFA 25(4)

[Woods Hole Oceanogr. Inst., Woods Hole, MA] During the past 125 years, the aquatic habitats and fish fauna of American deserts have undergone considerable change. Several endemic species have become extinct and many others have been either locally exterminated or are so endangered that they too, may disappear. The deterioration of the native fish fauna and the massive alteration of their ecosystems can be attributed to construction of damns, water diversions, pollution, mining of groundwater, and the introduction of exotic species. Such interference with delicate and complex ecosystems has been strongly reflected by the fish fauna. Despite these alterations, much has been learned about relationships between these fishes and their ecosystems. Basic principles of ecology and physiology operate here as they do for systems in humid areas. The environments range from constant temperature springs and cold, clear streams, to turbid rivers, hypersaline pools, desiccating lakes, and intermittent streams. Many have fragile watersheds that are extensive when compared to similar bodies of water in humid regions. Other habitats, such as springs and marshes, depend upon vast underground aquifers remaining from the last glacial period. Fishes in desert regions, largely derived from oceanic stocks or relicts from previous pluvial periods, have evolved morphological, physiological, and life history strategies that are closely tuned to their environment. In large rivers, fishes can tolerate extreme fluctuations of salinity and temperature but have been unable to alter their physiological resistance during critical portions of their life cycle. For all fishes, environmental variability and producivity affect life history strategies, behavior, population size, distribution, and community structure.

80-002871 Prikhod'ko, B. I. RELATIONSHIP BETWEEN ABUNDANCE OF YOUNG CASPIAN "ANCHOVY KILKA", *CLUPEONELLA ENGRAULIFORMIS*, AND WATER TEMPERATURE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):86-95.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

80-002871 CONTINUED 1979. SFA 25(4)
[KaspNIRKh, Astrakhan, USSR] The connection between the yield of young of the Caspian "anchovy kilka", *Clupeonella engrauliformis*, and water temperature in different seasons is examined. The increased spawning intensity of the anchovy kilka in the east of the Caspian, where its young are found in winter in the streams of a warm current, is an adaptation of the species for the increased survival of progeny.

80-002872 Rahel, F. J. and J. J. Magnuson. pH AND FISH SPECIES RICHNESS IN BOG LAKES. *Bull. Ecol. Soc. Am.* 61(2):87. June 1980. Abstract only. SFA 25(4)
[Univ. Wis., Madison] Bog lakes are common in northern latitudes, forming a unique biotope characterized by low pH, excessive detritus accumulation and a distinctive littoral plant community. Such lakes in northern Wisconsin have an impoverished fish fauna dominated by yellow perch (*Perca flavescens*) and several centrarchids. To determine which habitat factors contribute to the low diversity of fishes, we sampled naturally acidic lakes ranging in pH from 4.4 to 6.9. Lakes were chosen so as to separate low pH from other factors which might limit species richness such as lack of hard bottom substrate, sparse submerged vegetation, the absence of inlets/outlets and the presence of abundant piscivores. Species richness was uncorrelated with pH, indicating that lack of suitable spawning habitat and interactions with predators were more important than low pH in excluding species from bog lakes. Only in bog lakes without large, fish predators did pH affect species richness. Such lakes were dominated by cyprinids at pH's above 5.0 but contained only mudminnows (*Umbra limi*) at pH's below 5.0.

80-002873 Sale, P. F. ASSEMBLAGES OF FISH ON PATCH REEFS--PREDICTABLE OR UNPREDICTABLE? *Environ. Biol. Fishes* 5(3):243-249. 29 Sept. 1980. SFA 25(4)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W. 2006, Australia] The structure of assemblages of fish on small patch reefs was experimentally investigated by totally denuding three experimental reefs, and following their 'recovery' and concomitant changes in three control reefs by subsequent visual censusing. Experimental treatment had no significant effect on the number of fish or species subsequently present, nor on the faunal composition of the assemblages. However, all assemblages, both control and experimental, exhibited significant change in structure through the 28 month period they were followed. Such assemblages thus appear to have low constancy, or stability, but high resilience. The results conform to those of previous small-scale or artificial reef studies, and are compatible with a view emphasising the role of variability in recruitment in determining the structure of reef fish assemblages.

80-002874 Tonn, W. M. and J. J. Magnuson. PATTERNS IN THE ASSEMBLY AND DIVERSITY OF FISH COMMUNITIES IN NORTHERN WISCONSIN LAKES. *Bull. Ecol. Soc. Am.* 61(2):87. June 1980. Abstract only. SFA 25(4)
[Univ. Wis., Madison] Fish community structure patterns were examined in winter and summer for 18 small lakes in northern Wisconsin. Study lakes were chosen along gradients of environmental disturbance, productivity, lake area and watershed size. Multivariate analyses helped discern two community types, "mudminnow-cyprinid" and "centrarchid-pike." Each type was distinct with regards to species composition and seasonal changes in composition. Multivariate analyses showed that environmental characteristics of lakes occupied by each community type differed consistently. Oxygen concentration in winter, interacting with the availability of refuges through migration, appeared central to the determination of the community types. Conditions similar to those predicted for islands at equilibrium seemed responsible for differences in species richness within centrarchid-pike assemblages. For mudminnow-cyprinid assemblages, the data suggested that a disturbance related mechanism helped maintain the greater than predicted numbers of species in the richer assemblages.

IDENTIFICATION, KEYS, CLASSIFICATION

80-002875 Badcock, J. and R. C. Baird. REMARKS ON SYSTEMATICS, DEVELOPMENT, AND DISTRIBUTION OF THE HATCHETFISH GENUS *STERNOPTYX* (PISCES, STOMIATOIDEI). *NOAA Fish. Bull.* 77(4):803-820. 1980. SFA 25(4)
[Inst. Oceanogr. Sci., Wormley, Godaliming, Surrey, England]

80-002876 Banister, K. E. and M. A. Clarke. A REVISION OF THE LARGE *BARBUS* (PISCES, CYPRINIDAE) OF LAKE MALAWI WITH A RECONSTRUCTION OF THE HISTORY OF THE SOUTHERN AFRICAN RIFT VALLEY LAKES. *J. Nat. Hist.* 14(4):483-542. July-Aug. 1980. SFA 25(4)
[Dep. Zool., Brit. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

80-002877 Borodulina, O. D. COMPOSITION OF THE "*POLYIPNUS SPINOSUS* SPECIES COMPLEX" (STERNOPTYCHIDAE, OSTEICHTYES) WITH A DESCRIPTION OF THREE NEW SPECIES OF THIS GROUP. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):1-10. 1979. SFA 25(4)
[P.P. Shirshov Inst. Oceanol., USSR Acad. Sci., Moscow, USSR]

80-002878 Branstetter, S. and R. L. Shipp. OCCURRENCE OF THE FINETOOTH SHARK, *CARCHARHINUS ISODON*, OFF DAUPHIN ISLAND, ALABAMA. *NOAA Fish. Bull.* 78(1):177-179. 1980. SFA 25(4)
[Univ. South Ala., Dauphin Island Sea Lab., P.O. Box 386, Dauphin Island, AL 36528]

80-002879 Collette, B. B. and J. L. Russo. *SCOMBEROMORUS MUNROI*, A NEW SPECIES OF SPANISH MACKEREL FROM AUSTRALIA AND NEW GUINEA. *Aust. J. Mar. Freshwater Res.* 31(2):241-250. Apr. 1980. SFA 25(4)
[Syst. Lab, NMFS, Natl. Mus. Nat. Hist., Washington, DC 20560]

80-002880 Duggins, C. F., Jr. SYSTEMATICS AND ZOOGEOGRAPHY OF *LUCANIA PARVA*, *FLORIDICHTHYS*, AND *MENIDIA* (OSTEICHTHYES: ATHERINIFORMES) IN FLORIDA, THE GULF OF MEXICO AND YUCATAN. *Ph.D. dissertation, Fla. State Univ.* 182p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):849. Sept. 1980. SFA 25(4)

80-002881 Forey, P. L. *LATIMERIA*: A PARADOXICAL FISH. *Proc. R. Soc. Lond. B Biol. Sci.* 208(1172):369-384. 17 July 1980. SFA 25(4)
[Dep. Palaeontol., Brit. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

80-002882 Fritzsche, R. A. and G. D. Johnson. EARLY OSTEOLOGICAL DEVELOPMENT OF WHITE PERCH AND STRIPED BASS WITH EMPHASIS ON IDENTIFICATION OF THEIR LARVAE. *Trans. Am. Fish. Soc.* 109(4):387-406. July 1980. SFA 25(4)
[Dep. Fish., Humboldt State Univ., Arcata, CA 95521]

80-002883 Leiby, M. M. and R. W. Yerger. THE GENUS *BASCANICHTHYS* (PISCES: OPHICHTHIDAE) IN THE GULF OF MEXICO. *Copeia* 1980(3):402-408. 6 Sept. 1980. SFA 25(4)
[Fla. Dep. Nat. Resour., 100 Eighth Ave., SE, St. Petersburg 33701]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

80-002884 Litvinenko, N. I. *SEBASTES FASCIATUS KELLYI* (SCORPAENIDAE) FROM COASTAL WATERS OFF EASTPORT MAINE, USA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):1-14. 1979. SFA 25(4)
[Perm Univ., Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

80-002885 Pietsch, T. W. and J. P. Van Duzer. SYSTEMATICS AND DISTRIBUTION OF CERATIOID ANGLERFISHES OF THE FAMILY MELANOCETIDAE WITH THE DESCRIPTION OF A NEW SPECIES FROM THE EASTERN NORTH PACIFIC OCEAN. *NOAA Fish. Bull.* 78(1):59-87. 1980. SFA 25(4)
[Coll. Fish., Univ. Wash., Seattle 98195]

80-002886 Powles, H. DESCRIPTIONS OF LARVAL SILVER PERCH, *BAIRDIELLA CHRYSOURA*, BANDED DRUM, *LARIMUS FASCIATUS*, AND STAR DRUM, *STELLIFER LANCEOLATUS* (SCIAENIDAE). *NOAA Fish. Bull.* 78(1):119-136. 1980. SFA 25(4)
[Pech. Oceans, Div. Sci., C.P. 15500, Quebec G1K 7Y7, Canada]

80-002887 Roberts, T. R. A REVISION OF THE ASIAN MASTACEMBELID FISH GENUS *MACROGNATHUS*. *Copeia* 1980(3):385-391. 6 Sept. 1980. SFA 25(4)
[Tiburon Cent. Environ. Stud., P.O. Box 855, Tiburon, CA 94920]

80-002888 Shaboneyev, I. Ye. and A. N. Kotlyar. A COMPARATIVE MORPHOECOLOGICAL ANALYSIS OF THE EASTERN PACIFIC FORMS OF *TRACHURUS SYMMETRICUS* AND THE ATLANTIC OCEANIC HORSE MACKEREL, *TRACHURUS PICTURATUS PICTURATUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(2):24-29. 1979. SFA 25(4)
[VNIRO, Moscow, USSR]

80-002889 Smith, M. L. and R. R. Miller. *ALLOTOCA MACULATA*, A NEW SPECIES OF GOODEID FISH FROM WESTERN MÉXICO, WITH COMMENTS ON *ALLOTOCA DUGESI*. *Copeia* 1980(3):408-417. 6 Sept. 1980. SFA 25(4)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

80-002890 Smith, M. L. and R. R. Miller. SYSTEMATICS AND VARIATION OF A NEW CYPRINODONTID FISH, *CYPRINODON FONTINALIS*, FROM CHIHUAHUA, MEXICO. *Proc. Biol. Soc. Wash.* 93(2):405-416. 28 Aug. 1980. SFA 25(4)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

80-002891 Steyskal, G. C. THE GRAMMAR OF FAMILY-GROUP NAMES AS EXEMPLIFIED BY THOSE OF FISHES. *Proc. Biol. Soc. Wash.* 93(1):168-177. 9 July 1980. SFA 25(4)
[Natl. Mus. Nat. Hist., Washington, DC 20560]

80-002892 Volobuyev, V. V.; Ye. D. Vasil'yeva and K. A. Savvaitova. THE SYSTEMATIC STATUS OF THE DIADROMOUS "CHUKCHI CHAR" OF THE GENUS *SALVELINUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):21-30. 1979. SFA 25(4)
[Magadan Dep., Pac. Res. Inst. Sea Fish. Oceanogr., USSR]

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PARASITES AND DISEASES-GENERAL

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[Estac. Piscicult., Esc. Agron., Univ. Centro-Occidental, Apt. Correos No. 400, Barquisimeto, Edo. Lara, Venezuela]

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[INRA, Fish Dis. Lab., Virol. Immunol. Res. Stn., 78850 Thiverval-Grignon, France]

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[Tift Coll., Forsyth, GA 31029]

BACTERIAL DISEASES

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[Microbiol. Div., Dep. Pathol., St. Luke's Hosp., Bethelehem, PA 18015] Bacteriologically sterile filtrates of 'tumourous' fish elicited formation of 'tumours' *in vivo* which were morphologically indistinguishable from those described by Wessing & Bargen (1959). Attempts to isolate the putative aetiologic 'virus' in primary and established cell cultures failed. When the lesions were examined for other compatible aetiologies, acid-fast stains revealed acid-fast bacilli and cultures grew *Mycobacterium fortuitum*. It is suggested that the 'kidney tumour virus' is actually soluble mycobacterial cell-fractions capable of eliciting tubercle formation *in vivo*.

80-002905 Cone, D. K.; J. D. Miller and W. K. Austin. THE PATHOLOGY OF "SADDLEBACK" DISEASE OF UNDERYEARLING ATLANTIC SALMON (*SALMO SALAR*). *Can. J. Zool.* 58(7):1283-1287. July 1980. In English with French summ. SFA 25(4)
[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada]

80-002906 Hilton, L. R. and J. L. Wilson. TERRAMYCIN-RESISTANT *EDWARDSIELLA TARDA* IN CHANNEL CATFISH. *Prog. Fish-Cult.* 42(3):159. July 1980. SFA 25(4)
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80-002907 Itami, T. and R. Kusuda. [STUDIES ON SPRAY VACCINATION AGAINST VIBRIOSIS IN CULTURED AYU--I. EFFECT OF BENTONITE AND pH ON VACCINATION EFFICACY.] *Bull. Jpn. Soc. Sci. Fish.* 46(5):533-536. May 1980. In with English summ. SFA 25(4)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi Pref. 783, Japan] Differences in efficacy among bentonite-added and/or pH-adjusted vaccines for spray vaccination against vibriosis in cultured ayu, *Plecoglossus altivelis* were investigated. *Vibrio anguillarum*, the etiological agent of vibriosis in ayu, was incubated in nutrient broth with shaking for 96 h at 25°C. Then the culture was inactivated with 0.5% formalin for 24h at 20°C. Five kinds of vaccine used in this study were GOULD'S vaccine, bentonite-added vaccine, pH-adjusted vaccine, formalin-killed vaccine and cell-free vaccine. Experimental groups of fish placed in dip net were sprayed with these vaccines at a pressure of 5 kg/cm^2 for 5-7 seconds by the sand blasting gun positioned 20-25 cm from fish. The artificial water-borne challenge with virulent *V. anguillarum* was carried out two weeks after vaccination. All except the cell-free vaccine were highly effective. From the experimental result the formalin-killed vaccine was also effective as well as GOULD's vaccine; it can be concluded that it is not necessary to add bentonite or to adjust pH of spray vaccine for the control of vibriosis in cultured ayu. All the fishes sprayed with

BACTERIAL DISEASES (CONTINUED)

80-002907 CONTINUED cell-free vaccine died two days after that of the control. This might indicate that cell-free vaccine contains the soluble antigens, which play a part in the protection of the pathogenic infection to some extent. Increase in agglutinating antibody titers of fish sera was observed in neither the immunized fish nor the control.

80-002908 Itami, T. and R. Kusuda. [STUDIES ON SPRAY VACCINATION AGAINST VIBRIOSIS IN CULTURED AYU--II. DURATION OF VACCINATION EFFICACY AND EFFECT OF DIFFERENT VACCINE PREPARATIONS.] *Bull. Jpn. Soc. Sci. Fish.* 46(6):699-703. June 1980. In Japanese with English summ. SFA 25(4)

[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan] Duration of vaccination efficacy and effect of different vaccine preparations for control of vibriosis in cultured ayu, *Plecoglossus altivelis*, were investigated. *Vibrio anguillarum*, the etiological agent of vibriosis in ayu, was incubated in nutrient broth with shaking at 25°C. Vaccines used in this study were formalin-killed vaccine-96 and heat-killed vaccine, both were prepared from 96h culture; and ultrasonicated vaccine and formalin-killed vaccine-48, were both prepared from 48h culture. Procedures of spray vaccination and artificial water-borne challenge were the same as reported previously. In the study on the duration of vaccination efficacy, formalin-killed vaccine-96, which was the most effective in the previous report, was used. Efficacy was maintained for 16 weeks, so that booster is unnecessary during almost the whole period of culturing ayu after spray vaccine is administed once. To examine the effect of different vaccine preparations, four kinds of vaccine described above were used. Formalin-killed vaccine-96 was the most effective among them and formalin-killed vaccine-48 was the least. But ultrasonicated vaccine had almost the same efficacy as formalin-killed vaccine-96. On the basis of these results, disrupted cell walls and released components are considered to be protective antigens against vibrio infection. Heat-killed vaccine was less effective than formalin-killed vaccine-96; however, it was still effective. Therefore, heat resistant antigens are considered to play an important role int the protection against vibriosis.

80-002909 Iwama, G. K. INCUBATION TIMES RESULTING FROM EXPERIMENTAL INJECTIONS OF KIDNEY DISEASE BACTERIA INTO JUVENILE COHO SALMON. *Prog. Fish-Cult.* 42(3):182-183. July 1980. SFA 25(4)

[Fish Wildl. Br., Minist. Environ., 400, 1019 Wharf St., Victoria, BC V8W 2Y9, Canada]

80-002910 Sakai, D. K. [INVASIVE ROUTES OF *AEROMONAS SALMONICIDA* SUBSP. *SALMONICIDA*. *Sci. Rep. Hokkaido Fish Hatchery* No. 34. p. 1-6. Dec. 1979. In Japanese with English summ. SFA 25(4)

[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

80-002911 Winter, G. W.; C. B. Schreck and J. D. McIntyre. RESISTANCE OF DIFFERENT STOCKS AND TRANSFERRIN GENOTYPES OF COHO SALMON, *ONCORHYNCHUS KISUTCH*, AND STEELHEAD TROUT, *SALMO GAIRDNERI*, TO BACTERIAL KIDNEY DISEASE AND VIBRIOSIS. *NOAA Fish. Bull.* 77(4):795-802. 1980. SFA 25(4)

[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis 97331] Juvenile coho salmon and steelhead trout of different stocks and three transferrin genotypes (AA, AC and CC), all reared in identical or similar environments, were experimentally infected with *Corynebacterium* sp., the causative agent of bacterial kidney disease, or with *Vibrio anguillarum*, the causative agent of vibriosis. Mortality due to the pathogens was compared among stocks within a species and among transferrin genotypes within a stock to determine whether there was a genetic basis for resistance to disease.

BACTERIAL DISEASES (CONTINUED)

80-002911 CONTINUED Differences in resistance to bacterial kidney disease among coho salmon stocks had a genetic basis. Stock susceptibility to vibriosis was strongly influenced by environmental factors. Coho salmon or steelhead trout of one stock may be resistant to one disease by susceptible to another. The importance of transferrin genotype fo coho salmon in resistance to bacterial kidney disease was stock specific; in stocks that showed differential resistance of genotypes, the AA was the most susceptible. No differences in resistance to vibriosis were observed among transferrin genotypes.

PROTOZOAN DISEASES

80-002912 Booker, O. J. and W. L. Current. ULTRASTRUCTURE OF *MYXOBILATUS* SP. (MYXOSPORIDA) IN THE LARGEMOUTH BASS. *J. Ala. Acad. Sci.* 51(3):184. July 1980. Abstract only. SFA 25(4)
[Dep. Zool.-Entomol., Auburn Univ., Auburn, AL 36830]

80-002913 Canning, E. U. and J. P. Nicholas. GENUS PLEISTOPHORA (PHYLUM MICROSPORA): REDESCRIPTION OF THE TYPE SPECIES, *PLEISTOPHORA TYPICALIS* GURLEY, 1893 AND ULTRASTRUCTURAL CHARACTERIZATION OF THE GENUS. *J. Fish Dis.* 3(4):317-338. July 1980. SFA 25(4)
[Imperial Coll., Silwood Park, Ascot, Berkshire SL5 7PY, England]

80-002914 Cheung, P. J.; R. F. Nigrelli and G. D. Ruggieri. STUDIES ON THE MORPHOLOGY OF *URONEMA MARINUM* DUJARDIN (CILIATEA: URONEMATIDAE) WITH A DESCRIPTION OF THE HISTOPATHOLOGY OF THE INFECTION IN MARINE FISHES. *J. Fish Dis.* 3(4):295-303. July 1980. SFA 25(4)
[Osborn Lab. Mar. Sci., N.Y. Aquarium, N.Y. Zool. Soc., Brooklyn 11224]

80-002915 Dyková, I. and J. Lom. TISSUE REACTIONS TO MICROSPORIDIAN INFECTIONS IN FISH. *J. Fish Dis.* 3(4):265-283. July 1980. SFA 25(4)
[Inst. Parasitol., Czech. Acad. Sci., Flemengovo nám. 2, 166 32 Praha 6, Czechoslovakia]

80-002916 Sanaullah, M. and A. T. A. Ahmed. GILL MYXOBOLIASIS OF MAJOR CARPS IN BANGLADESH. *J. Fish Dis.* 3(4):349-354. July 1980. SFA 25(4)
[Aquacult. Exp. Stn., Mymensingh, Bangladesh]

80-002917 Solangi, M. A. and R. M. Overstreet. BIOLOGY AND PATHOGENESIS OF THE COCCIDIUM *EIMERIA FUNDULI* INFECTING KILLIFISHES. *J. Parasitol.* 66(3):513-526. June 1980. SFA 25(4)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

VIRAL DISEASES

80-002918 Bowser, P. R. and J. A. Plumb. CHANNEL CATFISH VIRUS: COMPARATIVE REPLICATION AND SENSITIVITY OF CELL LINES FROM CHANNEL CATFISH OVARY AND THE BROWN BULLHEAD. *J. Wildl. Dis.* 16(3):451-454. July 1980.

VIRAL DISEASES (CONTINUED)

80-002918 CONTINUED SFA 25(4)
[Univ. Calif., Bodega Mar. Lab., P.O. Box 247, Bodega Bay 94923] A cell line derived from channel catfish ovary tissue was compared with the brown bullhead (BB) cell line for their respective abilities to replicate and detect channel catfish virus (CCV). The channel catfish ovary cell line (CCO) produced cytopathic effects (CPE) more rapidly and detected CCV at higher dilutions than did the BB cell line. Produciton of CCV was more rapid in CCO cells than in BB cells, but the peak titers of the two lines were not significantly different. The CCO cell line was shown to be the more sensitive cell line for CCV research and diagnostics.

80-002919 Kelly, R. K.; H. R. Miller; O. Nielsen and J. W. Clayton. FISH CELL CULTURE: CHARACTERISTICS OF A CONTINUOUS FIBROBLASTIC CELL LINE FROM WALLEYE (*STIZOSTEDION VITREUM VITREUM*). *Can. J. Fish. Aquatic Sci.* 37(7):1070-1075. July 1980. SFA 25(4)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

80-002920 Schwedler, T. E. CHARACTERISTICS OF A NEW VIRUS FROM GOLDEN SHINERS, *NOTEMIGONUS CRYSOLEUCAS*. *Ph.D. dissertation, Auburn Univ.* 70p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(1):8. July 1980. SFA 25(4)

80-002921 Watanabe, T.; K. Tanaka; O. Tamura; Y. Nakagawa and K. Takahashi. FINE STRUCTURE OF THE NORMAL AND VIRUS-INFECTED CELLS DERIVED FROM THE KIDNEY OF YAMAE, *ONCORHYNCHUS MASOU*. *Bull. Jpn. Soc. Sci. Fish.* 46(4):401-406. Apr. 1980. SFA 25(4)
[Sch. Fish. Sci., Kitasato Univ., Okirai, Sanrikee-cho, Iwate 022-01, Japan]

OTHER DISEASES AND PARASITES

80-002922 Bell, D. A. and M. Beverley-Burton. PREVALENCE AND INTENSITY OF *CAPILLARIA CATOSTOMI* (NEMATODA: TRICHUROIDEA) IN WHITE SUCKER (*CATOSTOMUS COMMERSONI*) IN SOUTHERN LAKE HURON, CANADA. *Environ. Biol. Fishes* 5(3):267-271. 29 Sept. 1980. SFA 25(4)
[Minist. Nat. Resour., 322 Kent St. West, Lindsay, ON K9V 2Z9, Canada]

80-002923 Benz, G. W. and W. J. Pohley. A CONSPICUOUS *PHILOMETRA* SP. (NEMATODA: PHILOMETRIDAE) FROM THE OCULO-ORBITS OF CENTRARCHID FISHES. *Proc. Helminthol. Soc. Wash.* 47(2):264-266. July 1980. SFA 25(4)
[Dep. Zool., Univ. Md., College Park 20742]

80-002924 Caballero C., E. and G. Caballero R. ESTUDIOS DE LA COLLECCIÓN DE TREMÁTODOS COLECTADOS POR HOWARD A. WINTER EN PECES DEL OCÉANO PACIFICO DE MÉXICO Y DE LOS ESTADOS UNIDOS DE NORTE AMÉRICA. VI. [STUDIES OF THE TREMATODES COLLECTED BY HOWARD A. WINTER IN FISH FROM THE PACIFIC OCEAN OF MEXICO AND THE UNITED STATES. VI.] *Rev. Biol. Trop.* 24(2):229-234. Dec. 1976. In Spanish with English summ. SFA 25(4)
[Apt. Post. No. 692, Mexico 1, D.F., Mexico]

80-002925 Caballero C., E. and G. Caballero R. ESTUDIO DE LA COLECCIÓN DE TREMÁTODOS COLECTADOS POR HOWARD A. WINTER EN PECES DEL OCÉANO PACÍFICO DE MÉXICO Y DE LOS ESTADOS UNIDOS DE NORTE AMÉRICA. V.

OTHER DISEASES AND PARASITES (CONTINUED)

80-002925 CONTINUED [STUDIES OF THE TREMATODES COLLECTED BY HOWARD A. WINTER IN FISH FROM THE PACIFIC OCEAN OF MEXICO AND THE UNITED STATES. V.] *Rev. Biol. Trop.* 24(2):191-198. Dec. 1976. In Spanish with English summ. SFA 25(4)
[Apt. Post. No. 692, Mexico 1, D.F., Mexico]

80-002926 Campbell, R. A. and J. Carvajal G. *ECHINOBOTHRIUM EUZETI*, A NEW CESTODE FROM THE SPIRAL VALVE OF A CHILEAN ELASMOBRANCH. *Proc. Helminthol. Soc. Wash.* 47(2):165-167. July 1980. SFA 25(4)
[Dep. Biol., Southeast Mass. Univ., North Dartmouth 02747]

80-002927 Curtis, M. A. and M. E. Rau. THE GEOGRPHICAL DISTRIBUTION OF DIPLOSTOMIAS (TREMATODA: STRIGEIDAE) IN FISHES FROM NORTHERN QUEBEC, CANADA, IN RELATION TO THE CALCIUM ION CONCENTRATIONS OF LAKES. *Can. J. Zool.* 58(7):1390-1394. July 1980. In English with French summ. SFA 25(4)
[Inst. Parasitol., McGill Univ., Macdonald Coll., Ste. Anne de Bellevue, PQ H9X 1C0, Canada]

80-002928 Deardorff, T. L. and R. M. Overstreet. TAXONOMY AND BIOLOGY OF NORTH AMERICAN SPECIES OF *GOEZIA* (NEMATODA: ANISAKIDAE) FROM FISHES, INCLUDING THREE NEW SPECIES. *Proc. Helminthol. Soc. Wash.* 47(2):192-217. July 1980. SFA 25(4)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

80-002929 Dubinina, M. N. TAPEWORMS (CESTODA, LIGULIDAE) OF THE FAUNA OF THE USSR. *Amerind Publ. Co. Pvt. Ltd., New Delhi, India* 320p. 1980. Available from U.S. Dep. Commerce, NTIS, Springfield, VA 22161]

80-002930 Fischthal, J. H. SOME DIGENETIC TREMATODES OF MARINE FISHES FROM ISRAEL'S MEDITERRANEAN COAST AND THEIR ZOOGEOGRPAHY, ESPECIALLY THOSE FROM RED SEA IMMIGRANT FISHES. *Zool. Scr.* 9(1):11-23. 1980. SFA 25(4)
[Dep. Biol. Sci., State Univ. N.Y., Binghamton]

80-002931 Goven, B. A.; J. P. Gilbert and J. B. Gratzek. APPARENT DRUG RESISTANCE TO THE ORGANOPHOSPHATE DIMETHYL (2,2,2-TRICHLORO-1-HYDROXYETHYL) PHOSPHONATE BY MONOGENETIC TREMATODES. *J. Wildl. Dis.* 16(3):343-346. July 1980. SFA 25(4)
[J. B. Gratzek: Dep. Med. Microbiol., Univ. Ga., Athens 30602] *Grodactylus elegans* on goldfish, (*Carassius auratus*) from a commercial farm were resistant to recommended dosages of dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate. Controlled experiments suggest that a dosage 100 times the commonly recommended minimal dosage (.25 mg/l) was required to remove trematodes. A hypothesis is proposed to account for the development of drug resistant trematodes based on the life cycle of the parasites and continual drug exposure.

80-002932 Lankester, M. W. and J. D. Smith. HOST SPECIFICITY AND DISTRIBUTION OF THE SWIM-BLADDER NEMATODES, *CYSTIDICOLA FARIONIS* FISCHER, 1798 AND *C. CRISTIVOMERI* WHITE, 1941 (HABRONEMATOIDEA), IN SALMONID FISHES OF ONTARIO. *Can. J. Zool.* 58(7):1298-1305. July 1980. In English with French summ. SFA 25(4)
[Dep. Biol., Lakehood Univ., Thunder Bay, ON P7B 5E1, Canada]

80-002933 Madhavi, R. LIFE HISTORY OF *ALLOCREADIUM HANDIAI* PANDE, 1937 (TREMATODA: ALLOCREADIIDAE) FROM THE FRESHWATER FISH *CHANNA PUNCTATA* BLOCH. *Z. Parasitenkd.* 63(1):89-97. Aug. 1980. SFA 25(4)
[Dep. Zool., Andhra Univ., Waltair 530003, India]

OTHER DISEASES AND PARASITES (CONTINUED)

80-002934 Muzzall, P. M. SEASONAL DISTRIBUTION AND ECOLOGY OF THREE CARYOPHYLLAEID CESTODE SPECIES INFECTING WHITE SUCKERS IN SE NEW HAMPSHIRE. *J. Parasitol.* 66(3):542-550. June 1980. SFA 25(4)
[Dep. Nat. Sci., Kedzie Lab., Mich. State Univ., East Lansing 48824]

80-002935 Russell, L. R. EFFECTS OF *TRUTTAEDACNITIS TRUTTAE* (NEMATODA: CUCULLANIDAE) ON GROWTH AND SWIMMING OF RAINBOW TROUT, *SALMO GAIRDNERI*. *Can. J. Zool.* 58(7):1220-1226. July 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, 1090 W. Pender St., Vancouver, BC V6E 2P1, Canada]

80-002936 Skorping, A. POPULATION BIOLOGY OF THE NEMATODE *CAMALLANUS LACUSTRIS* IN PERCH, *PERCA FLUVIATILIS* L., FROM AN OLIGOTROPHIC LAKE IN NORWAY. *J. Fish Biol.* 16(5):483-492. May 1980. SFA 25(4)
[Univ. Tromso, Inst. Biol. Geol., P.O. Box 790 N-9001 Tromso, Norway]

80-002937 Whittaker, F. H. and J. Carvajal G. SCANNING ELECTRON MICROSCOPY OF SCOLICES OF SOME CESTODES FROM ELASMOBRANCHS. *Proc. Helminthol. Soc. Wash.* 47(2):256-259. July 1980. SFA 25(4)
[Dep. Biol., Univ. Louisville, Louisville, KY 40208]

80-002938 Williams, E. H., Jr. *ROGERSUS ROGERSI* GEN. ET SP. N. (CESTODA: CARYOPHYLLAEIDAE) FROM THE BLACKTAIL REDHORSE, *MOXOSTOMA POECILURUM* (JORDAN), (OSTEICHTHYES) IN THE SOUTHEASTERN UNITED STATES. *J. Parasitol.* 66(3):564-568. June 1980. SFA 25(4)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708]

80-002939 Wootten, R. and D. C. Cann. ROUND WORMS IN FISH. *Torry Res. Stn. Advis. Note* No. 80. 6p. May 1980. SFA 25(4)
[Torry Res. Stn., P.O. Box 31, 135 Abbey Rd., Aberdeen AB9 8DG, Scotland]

POLLUTION

80-002940 Bastürk, O.; M. Dogan; I. Salihoglu and T. I. Balkas. DDT, DDE, AND PCB RESIDUES IN FISH, CRUSTACEANS AND SEDIMENTS FROM THE EASTERN MEDITERRANEAN COAST OF TURKEY. *Mar. Pollut. Bull.* 11(7):191-195. July 1980. SFA 25(4)
[T. I. Balkas: M.E.T.U. Mar. Sci. Dep., P.K. 28, Erdemli, Icel, Turkey]

80-002941 Buggiani, S. S. and C. Vannuchi. MERCURY AND LEAD CONCENTRATIONS IN SOME SPECIES OF FISH FROM THE TUSCAN COASTS (ITALY). *Bull. Environ. Contam. Toxicol.* 25(1):90-92. July 1980. SFA 25(4)
[Inst. Gen. Pathol. Pathol. Anat., Vet. Med., Univ. Pisa, via delle Piagge, 2, Pisa, Italy]

80-002942 Hildebrand, S. G.; R. H. Strand and J. W. Huckabee. MERCURY ACCUMULATION IN FISH AND INVERTEBRATES OF THE NORTH FORK HOLSTON RIVER, VIRGINIA AND TENNESSEE. *J. Environ. Qual.* 9(3):393-400. July-Sept. 1980. SFA 25(4)
[Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

POLLUTION (CONTINUED)

80-002943 Hudson, P. L. and S. J. Nichols. RELATION BETWEEN ZOOPLANKTON MIGRATION AND ENTRAINMENT IN A SOUTH CAROLINA COOLING RESERVOIR. *Proc. Waste Heat Manage. Util. Conf.* 26:1-15. 1979. SFA 25(4)
[U.S. FWS, Southeast Reservoir Invest., 206 Hwy. 123 Bypass, Clemson, SC 29631] Knowledge of the vertical and areal distribution of zooplankton could be used to influence the siting and design of intake structures for condenser cooling water systems of steam-electric and hydroelectric power stations. We studied the vertical distribution of zooplankton in Keowee Reservoir, South Carolina, a cooling reservoir for a 2580-MW nuclear power plant. The nuclear plant withdraws hypolimnetic water from depths of 20-27 m, beneath a surface skimmer wall for once-through condenser cooling. Diel and seasonal variations in vertical distributions of zooplankton influenced the degree of entrainment at the power plant. For about 9 months, zooplankton was surface oriented, and only relatively small amounts were entrained. During July, August and September, however, most zooplankters were bottom-oriented during the day, and large numbers were entrained whereas at night most moved to or near the surface and few were entrained. The danger of entrainment during these months was thus restricted largely to the 12 to 13 daylight hours.

80-002944 Ikeda, S. and T. Yokoi. FISH POPULATION DYNAMICS UNDER NUTRIENT ENRICHMENT--A CASE OF THE EAST SETO INLAND SEA. *Ecol. Model.* 10(3/4):141-165. Aug. 1980. SFA 25(4)
[Dep. Appl. Math. Phys., Fac. Eng., Kyoto Univ., Kyoto 606, Japan] The significant increase of pollutants in the sea and the slow exchange rate of sea water between the inland sea and the ocean have worsened the general environmental conditions in the Seto Inland Sea since the 1960s. In particular, the enormous amounts of nutrients such as nitrogen and phosphorus flowing into the sea seem to have had a wide range of effects on its fish population. In this paper, a theoretical model of fish population dynamics in the eutrophicated inland sea is proposed, based on the prey-predator relationship of the Lotka-Volterra type. This model is validated by checking the recent fishery statistics of the sea area. Specific attention is focused on the impact of nutrient enrichment on fish population dynamics.

80-002945 Jan, J. and S. Malneršič. CHLORINATED BENZENE RESIDUES IN FISH IN SLOVENIA (YUGOSLAVIA). *Bull. Environ. Contam. Toxicol.* 24(6):824-827. June 1980. SFA 25(4)
[Publ. Health Inst. Slovenia, Trubarjiva 2, Ljubljana, Yugoslavia]

80-002946 Mathur, D. and P. L. McCreight. EFFECTS OF HEATED EFFLUENT ON THE REPRODUCTIVE BIOLOGY OF WHITE CRAPPIE, *POMOXIS ANNULARIS* IN CONOWINGO POND, PENNSYLVANIA. *Arch. Hydrobiol.* 88(4):491-499. 1980. SFA 25(4)
[RMC Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518] One of the potential concerns relative to the effects of heated discharges on reproductive biology is the alteration in spawning times of fishes. The effects of operation of Peach Bottom Atomic Power Station on the spawning times of the white crappie, *Pomoxis annularis* were studied in Conowingo Pond, a 35.8 km^2 impoundment on the lower Susquehanna River, Pennsylvania. Seasonally, the water temperature in the thermal plume averaged 5.6 to 11.1°C above the ambient temperature. Although a high variability existed in gonosomatic indices of white crappie no consistent significant differences occurred between the preoperational (1971-1973) and postoperational (1974-1977) periods. There was no evidence of earlier spawning in the thermal plume than in the ambient areas as determined from gonosomatic ratios and larval fish catches. Temperature at peak spawning was similar among years and areas. However, the gonosomotic ratios of crappie collected in the thermal plume were slightly lower than those from the ambient areas.

POLLUTION (CONTINUED)

80-002947 Murray, L. A.; M. G. Norton; R. S. Nunny and M. S. Rolfe. THE FIELD ASSESSMENT OF EFFECTS OF DUMPING WASTES AT SEA: 6. THE DISPOSAL OF SEWAGE SLUDGE AND INDUSTRIAL WASTE OFF THE RIVER HUMBER. *Minist. Agric. Fish. Res. Tech. Rep.* No. 55. 35p. 1980. SFA 25(4)
[Fish. Lab., Burnham-on-Crouch, England]

80-002948 Philippart, J. C. INCIDENCES DE LA POLLUTION ORGANIQUE ET DE L'EUTROPHISATION SUR LA FAUNE ICHTYOLOGIQUE DE LA SEMOIS. [THE EFFECTS OF ORGANIC POLLUTION AND EUTROPHICATION ON THE FISH FAUNA OF THE RIVER SEMOIS.] *Ann. Limnol.* 16(1):77-89. 1980. In French with English summ. SFA 25(4)
[Unit. Rech. Piscicoles, 22, Quai Van Beneden, B4020 Liège, Belgium]

80-002949 Sanders, H. L.; J. F. Grassle; G. R. Hampson; L. S. Morse; S. Garner-Price and C. C. Jones. ANATOMY OF AN OIL SPILL: LONG-TERM EFFECTS FROM THE GROUNDING OF THE BARGE *FLORIDA* OFF WEST FALMOUTH, MASSACHUSETTS. *J. Mar. Res.* 38(2):265-380. May 1980. SFA 25(3)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] To determine carefully the effects on the marine and estuarine benthos of Number 2 fuel oil spilled by the barge *FLORIDA* off West Falmouth, Massachusetts, we sampled for many months along an onshore-offshore gradient of pollution, and less intensively at unoiled sites. Analyses of hydrocarbons established that pollution was greatest and most persistent in the intertidal and subtidal zones of Wild Harbor River, less severe in degree and duration at stations farthest from shore. A variety of concurrent analyses showed that disturbance of the fauna was most severe and longest lasting at the most heavily oiled sites, and least severe but perceptible at lightly oiled stations. Patterns of disturbance were not related to granulometry of the sediments. Plants, crustaceans, fish, and birds suffered both high mortality immediately after the spill, and physiological and behavioral abnormalities directly related to high concentrations of the fuel oil. Five years after the spill its effects on the biota were still detectable, and partly degraded #2 fuel oil was still present in the sediments in Wild Harbor River and estuary.

80-002950 Stout, V. F. ORGANOCHLORINE RESIDUES IN FISHES FROM THE NORTHWEST ATLANTIC OCEAN AND GULF OF MEXICO. *NOAA Fish. Bull.* 78(1):51-58. 1980. SFA 25(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

80-002951 Tanabe, S.; H. Tanaka; R. Tatsukawa and I. Nakamura. [ORGANOCHLORINE COMPOUND RESIDUES IN SEVERAL SPECIES OF FISHES CAUGHT OFF CHILE.] *Bull. Jpn. Soc. Sci. Fish.* 46(6):763-769. June 1980. In Japanese with English summ. SFA 25(4)
[Fac. Agric., Ehime Univ., 5-7, Tarumi-3, Matsuyama 790, Japan]

FISH KILLS

80-002952 Giussani, G.; R. De Bernardi; R. Mosello and P Ghittino. SITUAZIONE LIMNOLOGICA DE LAGO DI CANDIA (PIEMONTE) IN CONCOMITANZA CON UNA GRAVE MORTALITÀ ITTICA DA BRANCHIOMICOSI. [LIMNOLOGICAL FEATURES OF LAGO DI CANDIA (PIEDMONT, ITALY) DURING A HEAVY FISH MORTALITY BY BRANCHIOMYCOSIS.] *Riv. It. Piscic. Ittiop.* 15(2):46-52. Apr.-May-June 1980. In Italian with English summ. SFA 25(4)
[C.N.R. Ist. Ital. Idrobiol., 28048 Verbania Pollanza, Novara, Italy]

TOXICOLOGY; BIOASSAYS

80-002953 Förlin, L. EFFECTS OF CLOPHEN A50, 3-METHYLCHOLANTHRENE, PREGNENOLONE-16α-CARBONITRILE AND PHENOBARBITAL ON THE HEPATIC MICROSOMAL CYTOCHROME *P*-450-DEPENDENT MONOOXYGENASE SYSTEM IN RAINBOW TROUT, *SALMO GAIRDNERI*, OF DIFFERENT AGE AND SEX. *Toxicol. Appl. Pharmacol.* 54(3):420-430. July 1980. SFA 25(3)
[Dep. Zoophysiol., Univ. Göteborg, Fack, 400 33 Göteborg, Sweden]

80-002954 Müller, R. FISH TOXICITY AND SURFACE TENSION OF NON-IONIC SURFACTANTS: INVESTIGATIONS OF ANTIFOAM AGENTS. *J. Fish Biol.* 16(5):585-589. May 1980. SFA 25(4)
[Swiss Fed. Inst. Water Resour. Water Pollut. Control, Lake Res. Lab., CH-6047 Kastanienbaum, Switzerland] Fish toxicity of etho-nonylphenol and of two non-ionic antifoam agents was tested using rainbow trout, *Salmo gairdneri*, in 24 h tests. The surface tension of these three compounds was found to depend on concentration and aging time of the test solutions. The toxicity of the surfactant was about twice as high as known values, with a LC_{50} of 8.5 mg/l at 15°C. The addition of antifoam agents to the surfactant solutions further lowered the surface tension but did not alter substantially the fish toxicity of the surfactant. Contrary to expectation, the fish survived in concentrated antifoam solutions at surface tensions as low as 31 dyn/cm for more than 24 h without any apparent damage. The relevance of the surface tension regarding the fish toxicity of detergents in general is critically discussed.

80-002955 Albright, L. J.; P. C. Oloffs and S. Y. Szeto. RESIDUES IN CUTTHROAT TROUT (*SALMO CLARKI*) AND CALIFORNIA NEWTS (*TARICHIA TOROSA*) FROM A LAKE TREATED WITH TECHNICAL CHLORDANE. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes* 15(4):333-349. SFA 25(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] The water of a lake was sprayed with technical chlordane to give a concentration of approximately 10 ppb. Resident California newts (*Tarichia torosa*) and cutthroat trout (*Salmo clarki*) were subsequently collected and analyzed for residue concentrations. The newts were collected at 14, 279, 451, and 1,036 days; the trout at 93, 279, 421, and 1,014 days. At first, the concentrations of residues were very high in both species and their composition, except for heptachlor, resembled that of technical chlordane. The heptachlor was quantitatively epoxidized in newts after 14 days but in trout, some heptachlor was still present after 93 days. Concentrations of total chlordane in body tissues of both species declined more than 98% with time. Of seven individually determined constituents of technical chlordane, *trans*-nonachlor was by far the most persistent, accounting for 49 to 55% of total chlordane in specimens collected last. Both animals produced oxychlordane, probably from γ-chlordane. Heptachlor, heptachlor epoxide and γ-chlordane were non-detectable in both species after 279 days. The results strongly suggest that the California newt metabolizes and eliminates chlordane residues more effectively than the cutthroat trout.

80-002956 Andreyev, A. A.; V. I. Kolupayev and T. A. Karpovich. THE EFFECT OF PHENOL ON OXYGEN STRESS IN THE MUSCLE TISSUE OF THE SIBERIAN ROACH, *RUTILUS RUTILUS LACUSTRIS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):164-166. 1979. SFA 25(4)
[Sci. Prod. Combine Paper Ind., Baykal'sk, USSR]

80-002957 Borgmann, U. INTERACTIVE EFFECTS OF METALS IN MIXTURES ON BIOMASS PRODUCTION KINETICS OF FRESHWATER COPEPODS. *Can. J. Fish. Aquatic Sci.* 37(8):1295-1302. Aug. 1980. In English with French summ. SFA 25(4)
[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002958 Bowers, M. A. III; D. E. Dostal and J. F. Heisinger. FAILURE OF SELENITE TO PROTECT AGAINST MERCURIC CHLORIDE IN EARLY DEVELOPMENTAL STAGES OF THE JAPANESE RICEFISH (*ORYZIAS LATIPES*). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 66(2):175-178. 1980. SFA 25(4)

[J. F. Heisinger: Dep. Biol., Univ. S. Dak., Vermillion 57069] Selenium dioxide pretreatment prior to liver formation in Japanese ricefish (*Oryzias latipes*) failed to protect against mercuric chloride. The mercuric chloride LC_{50}s and 95% confidence limits for selenium pretreated *Oryzias latipes* and for those not pretreated were 5.8 (5.6-6.1) mg/l; and 5.9 (5.5-6.2) mg/l, respectively. Selenium pretreatment following liver formation was protective against mercuric chloride. The mercuric chloride LC_{50}s and 95% confidence limits for selenium pretreated embryos and for those not pretreated were 7.6 (7.0-8.2) mg/l; and 6.5 (6.1-7.0) mg/l respectively. The central roles of the liver, circulatory system and kidney in selenium protection against mercury are discussed.

80-002959 Fisher, J. W.; C. B. Harrah and W. O. Berry. HYDRAZINE: ACUTE TOXICITY TO BLUEGILLS AND SUBLETHAL EFFECTS ON DORSAL LIGHT RESPONSE AND AGGRESSION. *Trans. Am. Fish. Soc.* 109(3):304-309. May 1980. SFA 25(4)

[Environ. Qual. Br., Air Force Aerospace Med. Res. Lab., Wright-Patterson Air Force Base, OH 45433]

80-002960 Goel, K. A. and V. Garg. 2,3',4-TRIAMINOAZOBENZENE-INDUCED HEMATOBIOCHEMICAL ANOMALIES IN FISH (*CHANNA PUNCTATUS*). *Bull. Environ. Contam. Toxicol.* 25(1):136-141. July 1980. SFA 25(4)

[Postgrad. Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India]

80-002961 Hazel, R. H. THE DEVELOPMENT OF WATER QUALITY CRITERIA FOR AMMONIA AND TOTAL RESIDUAL CHLORINE FOR THE PROTECTION OF AQUATIC LIFE IN TWO JOHNSON COUNTY, KANSAS STREAMS. *Ph.D. dissertation, Univ. Kans.* 199p. 1979. From Diss. Abstr. Int. B Sci. Eng. 41(1):117. July 1980. SFA 25(4)

80-002962 Ito, Y. and T. Murata. [CHANGES IN GLUCOSE, PROTEIN CONTENTS AND ENZYME ACTIVITIES OF SERUM IN CARP ADMINISTERED ORALLY WITH PCB.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):465-468. Apr. 1980. In Japanese with English summ. SFA 25(4)

[Women's Jr. Coll. Tokai Univ., Miyamae-cho, Shizuoka 420, Japan]

80-002963 Ito, Y.; K. Nishimura and T. Murata. [EFFECTS OF PCB ON LYSOSOMES IN THE HEPATOPANCREAS OF CARP.] *Bull. Jpn. Soc. Sci. Fish.* 46(4):469-472. Apr. 1980. In Japanese with English summ. SFA 25(4)

[Women's Jr. Coll. Tokai Univ., Miyamae-cho, Shizuoka 420, Japan]

80-002964 Iwama, G. K. and G. L. Greer. EFFECT OF A BACTERIAL INFECTION ON THE TOXICITY OF SODIUM PENTACHLOROPHENATE TO JUVENILE COHO SALMON. *Trans. Am. Fish. Soc.* 109(3):290-292. May 1980. SFA 25(4)

[Minist. Environ., Fish. Wildl. Br., 400, 1019 Wharf St., Victoria, BC V8W 2Y9, Canada]

80-002965 Knowles, C. O.; H. J. Benezet and F. L. Mayer, Jr. TRIDIAZURON UPTAKE, DISTRIBUTION AND METABOLISM IN BLUEGILLS AND CHANNEL CATFISH. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes* 15(4):351-364. SFA 25(4)

[Dep. Entomol., Univ. Mo., Columbia 65211]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002966 Lebsack, M. E.; A. D. Anderson; K. F. Nelson and D. S. Farrier. SUBLETHAL EFFECTS OF AN *IN SITU* OIL SHALE RETORT WATER ON RAINBOW TROUT. *Toxicol. Appl. Pharmacol.* 54(3):462-468. July 1980. SFA 25(3)
[Sch. Pharm., Univ. Wyo., Laramie 82071] An *in situ* oil shale process water, designated Omega-9 water, was used in sublethal concentrations in flow-through bioassays with rainbow trout. Exposure for 96 hr to 0.3% of Omega-9 water (approximately 70% of the LC50) decreased blood packed cell volume (PCV) and hemoglobin concentration. This concentration of Omega-9 water also decreased plasma alkaline phosphatase (AP) activity and protein concentration and caused threefold increases in plasma ammonia levels. Exposure to sublethal concentration of a solution of the 13 major inorganic constituents of Omega-9 water also decreased PCV and plasma AP activity and increased plasma ammonia levels. This study also found that no sublethal effects on blood hemoglobin, protein and alkaline phosphatase occurred at a toxic level less than a fifth of the level of the LC50.

80-002967 McCann, J. A. and R. K. Hitch. SIMAZINE TOXICITY TO FINGERLING STRIPED BASS. *Prog Fish-Cult.* 42(3):180-181. July 1980. SFA 25(4)
[U.S. EPA, Off. Pestic. Prog., Bldg. 288, ARC-East, Beltsville, MD 20705]

80-002968 Moles, A. SENSITIVITY OF PARASITIZED COHO SALMON FRY TO CRUDE OIL, TOLUENE, AND NAPHTHALENE. *Trans. Am. Fish. Soc.* 109(3):293-297. May 1980. SFA 25(4)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

80-002969 Nava, M. E. and F. R. Engelhardt. COMPARTMENTALIZATION OF INGESTED LABELLED PETROLEUM IN TISSUES AND BILE OF THE AMERICAN EEL (*ANGUILLA ROSTRATA*). *Bull. Environ. Contam. Toxicol.* 24(6):879-885. June 1980. SFA 25(4)
[F. R. Engelhardt: Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]

80-002970 Niimi, A. J. and C. Y. Cho. UPTAKE OF HEXACHLOROBENZENE (HCB) FROM FEED BY RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ. Contam. Toxicol.* 24(6):834-839. June 1980. SFA 25(4)
[Can. Cent. Inland Waters, 867 Lakeshore Rd., Burlington, ON L7S 1X9, Canada]

80-002971 Norton, M. G. and F. L. Franklin. RESEARCH INTO TOXICITY EVALUATION AND CONTROL CRITERIA OF OIL DISPERSANTS. *Minist. Agric. Fish. Food Dir. Fish. Res. Fish. Res. Tech. Rep.* No. 57. 20p. 1980. SFA 25(4)
[Fish. Lab., Burnham-on-Crouch, England]

80-002972 Oksama, M. and R. Kristoffersson. THE TOXICITY OF PHENOL TO *PHOXINUS PHOXINUS*, *GAMMARUS DUEBENI*, AND *MESIDOTEA ENTOMON* IN BRACKISH WATER. *Ann. Zool. Fenn.* 16(3):209-216. 1979. SFA 25(4)
[Tvärminne Zool. Stn., Univ. Helsinki, SF-10850 Tvärminne, Finland] The toxicity of phenol to the minnow *P. phoxinus* (L.) and to the crustaceans *M. entomon* (L.) and *G. duebeni* Lillj., all taken from the brackish water of the Baltic Sea, was determined at two temperatures using continuous flow bioassay. The lethal threshold concentrations (LTC) and the conventional 96-h LC50 values were estimated by the log-probit method. For *Mesidotea* the LTC of phenol is 85-100 ppm, for *Gammarus* 32-41 ppm and for *Phoxinus* 10 ppm. For the crustaceans the 96-h LC50 values were two to four times higher than the LTC, whereas for the minnow they were equivalent. In tests on *Mesidotea* 4-chlorophenol was two to three times as toxic as phenol. A temperature rise from 5°C to 10°C had no effect on the toxicity of phenol at LTC. At higher concentrations a temperature increase accelerated

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002972 CONTINUED the toxic effect of both penol (*Gammarus*) and 4-chlorophenol (*Mesidotea*).

80-002973 Rao, D. M. R.; A. P. Devi and A. S. Murty. RELATIVE TOXICITY OF ENDOSULFAN, ITS ISOMERS, AND FORMULATED PRODUCTS TO THE FRESHWATER FISH *LABEO ROHITA*. *J. Toxicol. Environ. Health* 6(4):825-834. July 1980. SFA 25(4)

[A. S. Murty: Nagarjuna Univ., Nagarjunanagar 522 510, South India] The relative toxicity of endosulfan, its isomers, and formulated products to the freshwater fish *Labeo rohita* was tested. The 96-h LC50 values showed that toxicity decreased in the following order: isomer A, 35% emulsifiable concentrate, technical endosulfan, 4% dust, and isomer B. The principal method of detoxification was by formation of endosulfan ether in the liver. Endosulfant, at both sublethal and lethal doses, enhanced oxygen consumption in *L. rohita*. Histological studies showed minor changes in the liver only.

80-002974 Sahib, I. K. A. and K. V. R. Rao. TOXICITY OF MALATHION TO THE FRESHWATER FISH *TILAPIA MOSSAMBICA*. *Bull. Environ. Contam. Toxicol.* 24(6):870-874. June 1980. SFA 25(4)

[Dep. Zool., S. V. Univ., Tirupati-517 502 A. P. India]

80-002975 Samoiloff, M. R.; S. Schulz; Y. Jordan; K. Denich and E. Arnott. A RAPID SIMPLE LONG-TERM TOXICITY ASSAY FOR AQUATIC CONTAMINANTS USING THE NEMATODE *PANAGRELLUS REDIVIVUS*. *Can. J. Fish. Aquatic Sci.* 37(7):1167-1174. July 1980. SFA 25(4)

[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

80-002976 Schneider, S. R.; J. D. Hendricks; G. H. Constantine, Jr. and R. E. Larson. TOBRAMYCIN NEPHROTOXICITY AND LETHALITY IN COHO SALMON. *Toxicol. Appl. Pharmacol.* 54(3):399-404. July 1980. SFA 25(3)

[Sch. Pharm., Oreg. State Univ., Corvallis 97331] Treatment of *Yersinia ruckeri*-infected juvenile coho salmon with tobramycin (TBM) revealed significant toxicity of the drug to these fish. In a group of fish receiving only 5 mg/kg/day a cumulative mortality of 100% was observed in 21 days. To verify the site of toxicity, a second study was conducted in order to histologically evaluate specific tissues and to determine dose-response characteristics. TBM produced nephrotoxicity in juvenile coho salmon at dosages only half as great as those required for an equivalent effect in mammals and did so over a much shorter treatment course. Histological examination revealed moderate to complete proximal tubule necrosis at 7.5 mg/kg every other day for 5 days. Lethality occurred at dosages as low as 2 mg/kg/day for 12 days. The data appear to indicate that salmon may be a potential model for studying the nephrotoxic potential of chemicals.

80-002977 Shaffi, S. A. ZINC INTOXICATION IN SOME FRESHWATER FISHES. I. VARIATIONS IN TISSUE ENERGY RESERVE. *Ann. Limnol.* 16(1):91-97. 1980. In English with French summ. SFA 25(4)

[Dep. Sci., R.C.E., N.C.E.R.T., Bhopal 462013, India]

80-002978 Stern, D. H. and M. S. Stern. MODIFIED ROTARY SHAKER PLATFORM. *Prog. Fish-Cult.* 42(3):188-189. July 1980. SFA 25(4)

[Dep. Biol., Univ. Mo., 107 Biol. Sci. Bldg., Kansas City 64110]

TOXICOLOGY; BIOASSAYS (CONTINUED)

80-002979 Thompson, K. W.; A. C. Hendricks and J. Cairns, Jr. ACUTE TOXICITY OF ZINC AND COPPER SINGLY AND IN COMBINATION TO THE BLUEGILL (*LEPOMIS MACROCHIRUS*). *Bull. Environ. Contam. Toxicol.* 25(1):122-129. July 1980. SFA 25(4)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

80-002980 Tomasso, J. R.; M. I. Wright; B. A. Simco and K. B. Davis. INHIBITION OF NITRITE-INDUCED TOXICITY IN CHANNEL CATFISH BY CALCIUM CHLORIDE AND SODIUM CHLORIDE. *Prog. Fish-Cult.* 42(3):144-146. July 1980. SFA 25(4)
[Ecol. Res. Cent., Dep. Biol., Memphis State Univ., Memphis, TN 38152]

80-002981 Tooby, T. E.; J. Lucey and B. Stott. TOLERANCE OF GRASS CARP, *CTENOPHARYNGODON IDELLA* VAL., TO AQUATIC HERBICIDES. *J. Fish Biol.* 16(5):591-597. May 1980. SFA 25(4)
[MAFF Fish. Lab., Remembrance Ave., Burnham-on-Crouch, Essex CM0 8HA, England] Because grass carp may feed selectively on water plants, additional conventional methods may be necessary for effective control of aquatic vegetation. For economic reasons aquatic herbicides are most likely to be used in conjunction with grass carp within an integrated aquatic weed control programme. The acutely lethal toxicities of ten herbicides to grass carp were measured. A preliminary evaluation of the risk to these fish showed that, when used at the recommended rate, the maximum herbicide concentration likely to be found in water should cause little harm to the fish, although attention should be given to the possible inhibition of feeding.

80-002982 Weis, F. and J. S. Weis. EFFECT OF ZINC ON FIN REGENERATION IN THE MUMMICHOG, *FUNDULUS HETEROCLITUS*, AND ITS INTERACTION WITH METHYLMERCURY. *NOAA Fish. Bull.* 78(1):163-166. 1980. SFA 25(4)
[Dep. Anat., N.J. Med. Sch., Newark 07103]

80-002983 Yasuno, M.; S. Hatakeyama and M. Miyashita. EFFECTS ON REPRODUCTION IN THE GUPPY (*POECILIA RETICULATA*) UNDER CHRONIC EXPOSURE TO TEMEPHOS AND FENITROTHION. *Bull. Environ. Contam. Toxicol.* 25(1):29-33. July 1980. SFA 25(4)
[Natl. Inst. Environ. Stud., Yatabe-Tsukuba 305, Japan]

RESEARCH AND MANAGEMENT-GENERAL

80-002984 Adams, P. B. LIFE HISTORY PATTERNS IN MARINE FISHES AND THEIR CONSEQUENCES FOR FISHERIES MANAGEMENT. *NOAA Fish. Bull.* 78(1):1-12. 1980. SFA 25(4)
[NMFS, Southwest Fish. Cent. Tiburon Lab., Tiburon, CA 94920] Natural selection operates at the life history level to maximize the number of surviving offspring. Life history characteristics will vary in consistent patterns to meet this constraint. When theoretical patterns in life histories were investigated in terms of *r* and *K* selection and compared with actual trends in life history characteristics of fishes, the agreement between observed and predicted trends was significant. The effects of harvesting on stocks with these life history trends were investigated and it was found that *K* selected type species would be highly sensitive to overfishing and, once depleted, recovery would require a long time.

80-002985 Graff, D. R. SOME THOUGHTS ON TROUT MANAGEMENT IN THE '80S. *Pa. Angler* 49(9):16-19. Sept. 1980. SFA 25(4)
[Rt. 2, Box 356-F-10, Bellefonte, PA 16823]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

80-002986 Kendall, R. L., (ed.) SELECTED COOLWATER FISHES OF NORTH AMERICA. *Am. Fish. Soc. Spec. Publ.* no. 11. xii + 437p. 1978. Available from Am. Fish. Soc., 5410 Grosvenor Lane, Bethesda, MD 21044.

A collection of papers on Percids and Esocids.--RS

80-002987 May, R. H. THE SEMANTICS OF MODERN TROUT MANAGEMENT: AN ANGLER'S VIEW. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:77-83. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901] SFA 25(4)

Angler activism spawned in the 1960's began to hatch out with increasing intensity in the 1970's. Trout fishermen made new and strident demands on fisheries managers for "quality trout fishing," "wild trout management", "catch-and-release," "no-kill areas," and others. These terms came to mean different things to different people, to the confusion of all. The 1980's may witness a refinement of angler demands for "naturalness" in their trout fisheries. A definition of Natural Trout Management is offered: "Management of trout populations so that any given population, in terms of numbers of fish and sizes of fish, is virtually unaffected by habitat degradation, or angling mortality." Implementation of this mandate would provide sportsmen the opportunity to fish over pristine-like populations of trout despite the presence of increasing numbers of anglers and the modification of habitat for man's other purposes.

REPORTS OF FISHERY STATIONS, STATES, ETC.

80-002988 FAO of the UN. COMMITTEE ON FISHERIES. *FAO Fish. Rep.* No. 228. x + 44p. 1979. SFA 25(4)

[Rome, Italy]

80-002989 Organisation for Economic Co-operation and Development. REVIEW OF FISHERIES IN OECD MEMBER COUNTRIES. 1979. ii + 253p. 1979. SFA 25(4)

HABITAT ALTERATIONS

80-002990 Baldes, R. J. BIG SPRING CREEK CHANNELIZATION SEVENTEEN YEARS LATER. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:96. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901] Abstract only. SFA 25(4)

[U.S. FWS, Lander, WY] A portion of Big Spring Creek was channelized by a bulldozer in 1961. Forty-two hundred feet of meandering stream habitat was changed into a 2200 foot ditch. Prior to the channel change, Big Spring Creek was a natural flowing spring-fed stream, bank-full and provided excellent trout fishing. Almost immediately after the channel alteration, the stream began to change. No longer was it bank-full. Severe erosion of the once undercut banks began to occur, and fishing success took a dramatic drop. Two areas immediately upstream from the channel change were studied to determine loss of adjacent land as a result of the alteration. Comparisons were made from aerial photos in 1938, 1953, 1962, and 1967. Color slides show dramatically results of the channelization. Fish production in various portions of Big Spring Creek are compared. Costs of projects in attempts to mitigate damage to property, prevention of flood damage, etc. are also presented.

HABITAT ALTERATIONS (CONTINUED)

80-002991 Benke, A. C.; D. M. Gillespie; F. K. Parrish; T. C. Van Arsdall, Jr.; R. J. Hunter and R. L. Henry III. BIOLOGICAL BASIS FOR ASSESSING IMPACTS OF CHANNEL MODIFICATION: INVERTEBRATE PRODUCTION, DRIFT, AND FISH FEEDING IN A SOUTHEASTERN BLACKWATER RIVER. *Ga. Inst. Technol. Environ. Resour. Cent.* ERC 06-79. xiii + 187p. Sept. 1979. SFA 25(4)
[Environ. Resour. Cent., Ga. Inst. Technol., Atlanta 30332]

80-002992 Chapman, D. W. and E. Knudsen. CHANNELIZATION AND LIVESTOCK IMPACTS ON SALMONID HABITAT AND BIOMASS IN WESTERN WASHINGTON. *Trans. Am. Fish. Soc.* 109(4):357-363. July 1980. SFA 25(4)
[P.O. Box 1362, McCall, ID 83638]

80-002993 Luey, J. E. and I. R. Adelman. DOWNSTREAM NATURAL AREAS AS REFUGES FOR FISH IN DRAINAGE-DEVELOPMENT WATERSHEDS. *Trans. Am. Fish. Soc.* 109(3):332-335. May 1980. SFA 25(4)
[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

80-002994 Newbold, J. D.; D. C. Erman and K. B. Roby. EFFECTS OF LOGGING ON MACROINVERTEBRATES IN STREAMS WITH AND WITHOUT BUFFER STRIPS. *Can. J. Fish. Aquatic Sci.* 37(7):1076-1085. July 1980. SFA 25(4)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

80-002995 Pister, E. P. MANAGING FISHERIES ON RANGELANDS. *Abst. Position Pap. Soc. Range Manage. Annu. Meet.* 33:12. 1980. Abstract only. SFA 25(4)
[Calif. Dep. Fish. Game, Bishop 93514] Oliver Wendell Holmes once stated: "No generalization is worth a damn, including this one." In many ways this same philosophy holds true as it relates to the controversy surrounding fisheries management versus livestock grazing. In short, we do not yet know enough about the problem except to state in general terms that, under many circumstances, optimum grazing and optimum trout production do not appear to be compatible. My personal experience in this field has been limited to the Inyo National Forest and adjoining areas of similar climate and soil types in the extreme western Great Basin. In some instances I have noted an apparent degradation of stream habitat; in others I have not. There have been puzzling situations wherein the most devastated areas in terms of livestock impact have produced the greatest numbers of trout (but probably not the greatest potential weight). Livestock grazing has recently come to the forefront in the newly created Golden Trout Wilderness, not only from the standpoint of fishery compatibility, but also from the standpoint of whether or not grazing is even aesthetically or biologically acceptable in the Golden Trout Wilderness, bearing in mind the basic intent of the Wilderness Act of 1964 and of Congress in establishing specifically an area implicitly dedicated to a magnificent fish species. One can sense a growing resentment within conservation groups that grazing should be curtailed or even eliminated if there exists any conflict whatsoever in managing the fishery resource. Perhaps it is time, they state, that sound resource management principles rather than tradition, McDonald's and Burger King, should direct the administration of public land resources. We are living in a time when the administrator of public lands is finding it increasingly difficult to fully implement multiple use management, just when the complexity of society is suggesting the more widespread use of this principle. Much of the tunnel vision syndrome affecting both sides of the issue, and attempts are made to broaden everyone's outlook. Examples of good and poor range practice (from the standpoint of the fishery biologist) are given, procedures for implementing remedial changes are suggested, and the question in raised for discussion: "Where do we go from here?" After all, what finer way to end a day of trout fishing than to down a rare top sirloin?

HABITAT ALTERATIONS (CONTINUED)

80-002996 Platts, W. S. LIVESTOCK GRAZING AND RIPARIAN/STREAM ECOSYSTEMS. *Abst. Position Pap. Soc. Range Manage. Annu. Meet.* 33:14. 1980. Abstract only. SFA 25(4)

[U.S. For. Serv. Intermountain For. Range Exp. Stn., Boise, ID 83706] The literature shows that streams modified by livestock grazing are wider and shallower. Generally, they have channels that contain more fine sediment, streambanks that are more unstable, banks that are less undercut, and higher summer water temperatures than natural streams. The literature infers that these changes decrease fish populations, but the data supporting this conclusion are on shaky grounds. More intensive study must be done to place this in proper perspective. The studies do show, however, that better management of livestock grazing is needed. In an extensive literature review, Meehan and Platts (1978) were unable to identify any widely used grazing strategy that is compatible with the environmental needs of streams. McGowan (1976) expresses doubts that present grazing strategies are capable of solving present grazing problems in the aquatic environment. Therefore, ongoing and future studies need to answer the following questions: 1. Which of the existing grazing systems are more compatible with the fishery resource? 2. Is there an ideal livestock grazing strategy for riparian areas? 3. What part can fencing play in protecting critical habitat? 4. How do different classes of livestock affect the riparian environment? 5. During what period of the grazing season is it best to utilize the forage in the riparian zone? 6. What grazing strategies will provide the best protection to brushy vegetation? 7. Can depleted riparian-stream ecosystems be restored through present grazing systems?

80-002997 Prinsenberg, S. J. MAN-MADE CHANGES IN THE FRESHWATER INPUT RATES OF HUDSON AND JAMES BAYS. *Can. J. Fish. Aquatic Sci.* 37(7):1101-1110. July 1980. SFA 25(4)

[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

80-002998 Stabler, L. A. BEEF STEAK AND WILD TROUT ... MAKING IT HAPPEN. *Abst. Position Pap. Soc. Range Manage. Annu. Meet.* 33:14. 1980. Abstract only. SFA 25(4)

[Calif. Trout, Inc., San Francisco 94126] Livestock and grazing land are a readily replenishable resource ... trout streams are not. Therefore, in the use of public grazing lands there must be a concern not only to provide required upland grazing pastures but at the same time to protect the intrinsic resource value of wild trout streams, coincident to riparian zone pastures. In the management of range lands the whole system has to consider the individuality of its parts. And those parts must be assessed and managed to their best and most productive use. Meadow streams are certainly one of the most fragile parts. Studies indicate unrestricted grazing on meadow streams practically render a stream devoid of its ability to support wild trout ... one of its best uses. Fortunately, additional studies have verified that with grazing exclosure, and rest, a meadow trout stream can repair itself to its more natural state in about 4 to 8 years. Meadow streams in their natural state have what's termed a "concave profile" i.e., deep undercuts above which grow lush riparian vegetation. When unrestricted grazing is allowed on these streams, the vegetation is virtually destroyed ... the banks break down to erode in the stream and additional siltation is caused by the bank sloughing. In one season of grazing, what was once a superior trout stream can become nothing more than a recontoured waterway. Meadow streams must be protected from unrestricted grazing. Fencing seems the most obvious restraint in providing this control. Off-site water development needs should be established. If riparian pasture grazing is critical to a herd's development then a methodology needs to be established to determine, limit, and control the grazing impact on a stream's vitality.

80-002999 U.S. Fish and Wildlife Service. SUMMARIES OF RIPARIAN AND STREAM ALTERATION STUDIES COMPLETED BY THE EASTERN ENERGY AND LAND USE TEAM. *U.S. Fish Wildl. Serv.* vi + 38p. July 1980. Available from Inf. Transfer

HABITAT ALTERATIONS (CONTINUED)

80-002999 CONTINUED Spec., East. Energy Land Use Team, Rt. 3, Box 44, Kearneysville, WV 25430] SFA 25(4)

HARVEST, CREEL CENSUS, ETC.

80-003000 Cauvin, D. THE VALUATION OF RECREATIONAL FISHERIES. *Can. J. Fish. Aquatic Sci.* 37(8):1321-1327. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB, Canada]

80-003001 Havey, K. A. and D. O. Locke. RAPID EXPLOITATION OF HATCHERY-REARED BROOK TROUT BY ICE FISHERMEN IN A MAINE LAKE. *Trans. Am. Fish. Soc.* 109(3):282-286. May 1980. SFA 25(4)
[Me. Dep. Inland Fish. Wildl., Augusta 04333]

80-003002 Lehtonen, H. and K. Salojärvi. KOTITARVE- JA VIRKISTYSKALASTUS SUOMESSA VUONNA 1975. [AMATEUR FISHING IN FINLAND IN 1975.] *Suom. Kalatalous* No. 48. p. 41-55. 1978. In Finnish with English summ. SFA 25(4)
[Riista-ja Kalatalouden Tutkimuslaitos, Kalantutkimusosasto PL 193, 00131 Helsinki 13, Finland]

80-003003 Lehtonen, H. RANNIKON SISÄVESIKALOJEN KALASTUS VUONNA 1976. [FISHING OF FRESHWATER FISHES IN FINNISH BALTIC SEA AREA IN 1976.] *Suom. Kalatalous* No. 48. p. 25-40. 1978. In Finnish with English summ. SFA 25(4)
[Riista-ja Kalatalouden Tutkimuslaitos, Kalantutkimuosasto PL 193, 00131 Helsinki 13, Finland]

80-003004 McAfee, M. E. RANDOM-STRATIFIED CREEL CENSUS FOR COMPARING FISHERMAN USE AND RETURN OF CREEL-SIZE TROUT IN SMALLER COLORADO RESERVOIRS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:1-4. 1980. Available @$5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526] The random-stratified count interview creel census system was used to determine fisherman use and returns of creel-size trout in 12 different Colorado reservoirs. Three of the reservoirs were in a heavily fished East Slope area, and the rest were located in two different areas of the West Slope. The censuses revealed fishing pressure ranging from 7 hours/acre to 1,600 hours/acre with variation ranging from ± 13% to ± 79%. Estimated returns of planted creel-size fish during their first summer in the lakes ranged from 2% to 114% with variation ranging from ± 9% to ± 108%. The major reasons for the wide variability in these estimates appear to be uneven fishing pressure and small fisherman samples at some of the West Slope waters. Sampling scheme changes which might be tried to improve the precision of these estimates are discussed. Certain problems with estimating returns of creel-size trout are also outlined. Despite the high variation in the estimates, the comparisons provide some valuable baseline information for fisheries work.

80-003005 Smith, C. L. ATTITUDES ABOUT THE VALUE OF STEELHEAD AND SALMON ANGLING. *Trans. Am. Fish. Soc.* 109(3):272-281. May 1980. SFA 25(4)
[Dep. Anthropol., Oreg. State Univ., Corvallis 97331]

REGULATIONS

80-003006 Anderson, R. O. THE ROLE OF REGULATIONS IN ECOLOGICAL MANAGEMENT. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:100. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[Mo. Coop. Fish. Res. Unit, Univ. Mo., Columbia] Ecological management is defined as those manipulations which utilize the workings of nature to achieve benefits desired by society. Such management must recognize the constraints imposed by the environment (carrying capacity, productivity) and the individual species (population dynamics, bioenergetics). Fundamental to the concept of ecological management is the concept of balance -- a structure and dynamics of populations, communities and ecosystems which achieve management objectives. In systems with satisfactory habitat and water quality characteristics, the primary problem facing fishery management is overharvest -- the removal of more than the surplus according to management objectives. Indices which utilize length-frequency and length-weight data can help managers recognize the existence of problems such as unsatisfactory rates of reproduction, growth, or mortality. These indices also provide a basis for establishing measurable objectives. Given a supportive public that is interested and concerned about the quality of fishing, appropriate regulations on harvest are a manager's most efficient and effective tactic. Appropriate regulations are those which solve the problems and meet the objectives.

80-003007 Behnke, R. J. SPECIAL REGULATIONS: HISTORICAL PERSPECTIVE. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:58-63. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)

[Dep. Zool., Colo. State Univ., Fort Collins 80523]

80-003008 Bell, S. C. and B. Canoles. IMPLICATIONS OF GAME AND FISH LAWS IN ALABAMA. *Auburn Univ. Agric. Exp. Stn. Circ.* 250. 22p. May 1980. SFA 25(4)

Although ownership of fish and wildlife is vested in the State, Alabama law recognizes that farmer-landowners have the exclusive right to catch and kill the fish and wild animals found on their land. In exercising these exclusive rights to hunt and fish on their property, farmers, like all other Alabamians, must abide by the rules and regulations of the State Department of Conservation. Through numerous statutory and case laws, the Alabama legal structure protects the farmer against intrusion upon his exclusive hunting and fishing rights. By the same token, Alabama law gives the farmer-landowner certain responsibility for the safety of hunters and fishermen on his farms other than trespassers. An additional right granted landowners is the right to propagate wild animals for the purpose of restocking their land with a given wildlife species. Alabama wildlife laws attempt to allow landowners the maximum utility from the wildlife resources found on their property, while at the same time ensuring that future generations of Alabamians will be able to continue benefiting from the State's abundant fish and wild animal populations.--summ.

80-003009 Bjornn, T. C. SPECIAL ANGLING REGULATIONS BENEFIT OVERFISHED TROUT POPULATIONS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:99. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[Coop. Fish. Res. Unit, Univ. Idaho, Moscow] Native cutthroat trout populations in the larger streams of central and northern Idaho were overfished, and in some cases virtually eliminated. Special angling regulations were instituted to reduce angling caused mortality as early as 1960 but mainly after 1970. Trout populations responded rapidly to the

REGULATIONS (CONTINUED)

80-003009 CONTINUED reduced mortality with increases in abundance (5-13 times) and average size. Some people no longer fish the streams with special regulations, but the public chose to maintain the wild trout populations rather than replace them with hatchery trout.

80-003010 Grant, G. L. CATCHING, RELEASING, AND TAGGING ATLANTIC SALMON IN ICELAND'S RIVER GRISMA. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:64-69. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901] SFA 25(4)

Generations of Atlantic salmon anglers have grown up with the imprimatur that all fish caught should be killed because they would die shortly after their release. A group of American anglers fishing Iceland's River Grimsa, along with the Icelandic river owners and the guides serving the river, wished to 1) check on the accuracy of this concept: 2) gain information on the habits and activity of the salmon after being caught and released; and 3) provide escapement for natural spawning. This is a report of the release of over 600 fly-caught Atlantic salmon taken in 1978 and 1979, and the tagging of over 400 of these fish. To the writer's knowledge, no similar research has been conducted with sea run Atlantic salmon and the findings reported herein shed some light where there was none previously.

80-003011 Gresswell, R. E. THE EFFECTS OF THE 330 MM MAXIMUM SIZE LIMIT ON THE CUTTHROAT TROUT FISHERY OF YELLOWSTONE LAKE: THE FIRST FIVE YEARS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:70-76. 1980. Available @$5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)

[P.O. Box 2, Yellowstone Natl. Park, WY 82190] Since the inception of Yellowstone Park over 100 years ago, Park visitation has steadily increased to recent levels of over 2.5 million visitors annually. Concomitant increases in angling effort occurred on Yellowstone Lake, the Park's most popular fishery. Although creel limits were periodically reduced between the 1880's and 1968, the condition of trout stocks and general measures of angling success continued to decrease. A 356 mm minimum size restriction imposed in 1970 helped to curb the sharp declines due to intense overfishing during the 1950's and 1960's. Despite initial benefits, however, it became evident that rising harvests and a rapid decrease of older and larger trout negated positive changes. A 330 mm maximum size restriction was implemented in 1975 in order to take advantage of compensatory survival in younger age groups and to recreate multiple age spawning stocks. Thus far, results are encouraging; numbers of older and larger fish have increased rapidly and most measures of angling success have remained stable or increased.

80-003012 Hudelson, R. A. THE CUTTHROAT TROUT POPULATION RESPONSE TO FLY FISHING ONLY REGULATIONS ON A PORTION OF FLAT CREEK WITHIN THE NATIONAL ELK REFUGE. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:100-101. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[Wyo. Game Fish. Dep., Jackson] Fly fishing only regulations were imposed on Flat Creek with the 1976 fishing season. The season opening date was established as August 1, to protect spawning activity and waterfowl nesting. Population samples were collected during April and October. The spring sample was designed to monitor trends in the spawning population. Mature males and spent females were dart tagged to monitor seasonal movement and the impact of harvest on mature fish. Trend information indicated fewer spawning fish in the stream each spring since 1976. The size range remained relatively constant indicating essentially the same age structure. Approximately 47% of the sample was made up of mature trout each year, indicating a decline in spawners from about 47 to 14 fish in four years. The fall sample was intended to establish trends of recruitment and measure harvest impact on catchable size fish. The number of fish in the samples has ocillated widely. This is

REGULATIONS (CONTINUED)

80-003012 CONTINUED attributed to flow regime and the associated electrofishing efficiency. The size range of sampled trout remained fairly constant through 1978. Young of the year trout were noticeably more abundant in 1977 and 1979. Harvest and use was measured through three years of creel census data. Then tendency of fly fishermen to practice catch and release was noted. Approximately 70-85% of caught fish were released. The number of creeled fish increased with angler use, but not in direct relationship. Use nearly doubled during the second season of the regulation and remained near that level in succeeding seasons. Harvest was about 0.1 trout per hour. Catch rates varied between 0.38 and 1.52 trout per hour, depending on flow regime. The data collected does not demonstrate a positive population response to special regulation. The decline in the spawning population was attributed to the cessation of stocking at the time tackle restrictions were instituted, thus reducing replacement of mature fish. The mortality of catchable size fish was about 30% between spring and fall samples in 1976 and 1978. In 1979 the fall sample of catchable size fish was about 1.3 times greater than the spring sample. However, tree revetments were placed in the stream to stabilize critical streambank situations, thus providing additional cover. The population increase appeared to be keyed directly to the addition of instream cover.

80-003013 Nehring, R. B. SPECIAL REGULATIONS EVALUATIONS IN COLORADO. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:84-94. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)

[Colo. Div. Wildl., Montrose 81401] Implementation of catch and release angling on two Colorado rivers resulted in a doubling of the catch-per-man-hour (CPMH) over the control sections and over previous years when catch and release angling was not in effect. A fisherman opinion survey indicated that over 93% of all fishermen contacted approved of the catch and release regulation regardless of the section of river fished or the type of lure in use at the time of survey. Where catch and release angling had been in effect for four years, numerical density was 2.9 times greater and standing crop was 4.2 times greater than in the control sections. Average size of the trout in the catch for both rainbow and brown trout was much larger in the catch and release water. More than 17 times as many trout over 381 mm (15 inches) were caught in the catch and release water as in the standard (8 trout/day bag limit) regulations section. The rainbow exploitation rate (total catch/total polutation X 100%) ranged from 149% to 304% in the two catch and release areas indicating the trout can be caught several times a season.

80-003014 Vincent, E. R. EFFECTS OF SPECIAL ANGLING REGULATIONS ON WILD TROUT POPULATIONS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:95. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. Abstract only. SFA 25(4)

[Mont. Dep. Fish. Wildl. Parks, Bozeman] Two study sections were set up on the Madison River between 6.0 and 10.0 miles below Quake Lake to determine the effect of heavy angling pressure on the wild rainbow trout populations. One section, Pine Butte, was open to catch-and-release fishing with artificial lures and flies only and the other section (Snoball) remained closed to all fishing. After two years of fishing closure, the Snoball section showed an increase of 121% in number and 137% in total pounds for two-year-old and older brown trout. After the first year of catch-and-release regulation, the two-year-old and older rainbow trout in the Pine Butte section increased 126% in number and 101% in total pounds while two-year-old and older brown trout increased 46% in number and 47% in total pounds. A total summer mortality of three-year-old and older trout was higher in the catch-and-release area than the fishing closure area, 47% versus 30%. A creel census-fish population study on the Karst Ranch section on the Gallatin River showed 33% increase in angling pressure from 1972. Total summer mortality of larger rainbow trout was low (less than 35%) except those five-year-old and older (12 inches and longer) which showed 65% summer loss. More trout were

REGULATIONS (CONTINUED)

80-003014 CONTINUED caught and released (57%) than kept (43%). Overall catch rates were higher during 1978 when no stocking of hatchery rainbow trout occurred than 1971 and 1972 when stocking occurred. Fly and bait anglers used the Karst study section in about equal numbers during the 1978 angling season.

MARKING AND TAGGING

80-003015 Baglin, R. E., Jr.; M. I. Farber; W. H. Lenarz and J. M. Mason, Jr. SHEDDING RATES OF PLASTIC AND METAL DART TAGS FROM ATLANTIC BLUEFIN TUNA, *THUNNUS THYNNUS*. *NOAA Fish. Bull.* 78(1):179-185. 1980. SFA 25(4)
[NMFS, c/o Alaska Dep. Fish Game, P.O. Box 686, Kodiak 99615]

80-003016 Bellamy, G. C. THE USE OF BIRD RINGS FOR THE INDIVIDUAL RECOGNITION OF FISH. *Freshwater Biol.* 10(4):371-374. Aug. 1980. SFA 25(4)
[Dep. Zool., Univ. Reading, England] Fish bearing celluloid bird rings on the anterior edge of the dorsal fin can be recognized individually in the field for several weeks. Grayling *Thymallus thymallus*, over 20 cm long, in a fast-flowing river retained recognizable rings for a mean of 47 days. Brown trout *Salmo trutta*, retained rings for comparable periods. Rings could be seen at distances up to 10 m, irrespective of the orientation of the fish to the observer. This marking technique compares favourably with others.

80-003017 Dando, P. R. and R. Ling. FREEZE-BRANDING OF FLATFISH: FLOUNDER, *PLATICHTHYS FLESUS*, AND PLAICE, *PLEURONECTES PLATESSA*. *J. Mar. Biol. Assoc. U.K.* 60(3):741-748. Aug. 1980. SFA 25(4)
[Lab. Mar. Biol. Assoc., Citadel Hill, Plymouth, England] The use of freeze-branding as a field-marking technique for flatfish is described. Similar recapture rates were obtained for flounders marked on the coloured, or eyed, side and for those marked on the white, or blind, side during the first two years after marking. Brands on adult flounders were still identifiable more than four years after release of the fish. The branding technique is also applicable to plaice.

STOCKING AND INTRODUCTIONS

80-003018 Bilton, H. R. and D. W. Jenkinson. RETURNS TO THE FISHERY AND ESCAPEMENT OF ADULT COHO SALMON FROM ACCELERATED AND NORMALLY REARED JUVENILES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 925. iv + 11p. Feb. 1980. In English with French summ. SFA 25(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Under normal hatchery operations, juvenile coho salmon (*Oncorhynchus kisutch*) are reared for at least 14 months before release to the sea as smolts. Reduction of the rearing period would reduce costs substantially. One means of reducing the rearing period would be to accelerate growth of the fish, resulting in the production of smolt-sized juveniles in a shorter period of time, at an earlier age. Such a technique also could have the advantage of increased generation time, whereby adults would mature in their 2nd rather than in their 3rd year of life. In the fall of 1973, an experiment to accelerate growth of coho was initiated at Rosewall Creek on Vancouver Island. During the winter of 1973-74, approximately 10,000 coho were accelerated to the smolt stage in 6 mo through control of temperature, photoperiod and feeding rate. These were marked, nose-tagged and released on June 10, 1974, along with approximately 12,000 normally reared (14 mo), nose-tagged coho. Early maturing male (jack)

STOCKING AND INTRODUCTIONS (CONTINUED)

80-003018 CONTINUED normal-sized (adult) coho originating from these releases were recovered in the escapement and in the fishery. The total return of adults from the accelerated release (3.3%) was much lower than the total return from the normal smolts (47.5%). Males predominanted among adults from the accelerated smolts; the reverse was true among adults from the normally reared smolts. Adults from the accelerated smolt release were smaller than those from the normal smolts. Hence the overall return of adults from normal smolts was 14 times that from accelerated smolts. Results of this one study indicate that rearing of accelerated smolts is not economically feasible.

80-003019 Egglishaw, H. J. and P. E. Shackley. SURVIVAL AND GROWTH OF SALMON, *SALMO SALAR* (L.), PLANTED IN A SCOTTISH STREAM. *J. Fish Biol.* 16(5):565-584. May 1980. SFA 25(4)

[Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland] Salmon eggs and unfed fry were planted in reaches (total length 2.8 km, mean width 4 m) of a Scottish stream between 1971 and 1977 and their subsequent progress was studied by sampling 16 sections (areas 38-126 m^2) of the stream. Brown trout are the only fish which spawn in the stream, waterfalls and a dam near its mouth preventing adult salmon and sea-trout passing upstream. There were no restraints on the downstream movement of fish except in 1977, when a fry trap was operated. In 1971 and 1974 boxes each containing 300 eggs were buried in groups of 3-6. In other years fry were evenly distributed 3.6-29.3 $/m^2$. At the end of the first growing season, salmon occurred at decreasing population densities for a distance of 600 m below the plantings, but after two growing seasons there was little remaining indication of their pattern of dispersion when planted. Rates of survival between planting and end of the growing season were 9.4-31%. Survival when eggs were planted (11.1-14.8%) was not affected by the numbers planted together at one point (900-1800) or the distance apart of groups of boxes (10-85 m). When fry were planted the instaneous morality rate (M) of the 0+ salmon during their first growing season was related to the inital stocking density (D_p) by the formula $M = 0.00637 + 0.00444 \log_{10} D_p$. Twenty-two to 88% of 0+ salmon present at the end of the growing season were still surviving in the stream as 1+ fish one year later. In 1973-1976 only a small number of 2+ salmon occurred, the majority having migrated between the end of the second growing season and the following spring. There were more 2+ salmon in 1977 and 1978 resulting from higher stocking densities in 1975 and 1976 and slower growth. Trout of several age classes were present but their population densities were never high ($<0.6/m^2$). Salmon reached a greater size than trout by the end of the first growing season. Their mean weight (W_0, g) at this time was inversely related to their population density (D_0, No./m^2) and the biomass (B_1, g/m^2) of 1+ salmon present, giving the relationship $\log_{10} W_0 = 0.6584 - 0.0558 D_0 - 0.0352 B_1$. The mean weight of 1+ salmon tended to be highest in sections where the 0+ salmon had reached a relatively large size the previous year. When a reach of the stream was planted twice (11 and 30 May 1977) with salmon fry (total 13.9 $/m^2$) at the same stage of development, *M* during the first growing season was 0.0099 per day. This was less than that of fry in a control (*M* = 0.0107) where the stocking density was lower (6.8 $/m^2$) and also less than in previous years when single planting rates of approximately $14/m^2$ were used (*M* = 0.0115). The double planting resulted in a wide range of lengths of 0+ salmon in September and the highest biomass values encountered during all experiments.

80-003020 Ohkuma, K.; S. Sasaki and Y. Sato. [STUDIES ON THE PLANTING OF HATCHERY-CULTURED MASU SALMON FRY INTO STREAMS. 8. OBSERVATIONS ON DISPERSAL AND RESIDENCE OF FRY RELEASED IN DIFFERENT MANNERS.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 34. p. 97-103. Mar. 1980. In Japanese with English summ. SFA 25(4)

STOCKING AND INTRODUCTIONS (CONTINUED)

80-003021 Puttmann, S. J. and D. T. Weber. VARIABLE WALLEYE FRY STOCKING RATES IN BOYD RESERVOIR, COLORADO. *Colo. Div. Wildl. Tech. Publ.* No. 33. viii + 47p. July 1980. SFA 25(4)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526] A research investigation was initiated in 1969 and continued through 1977 to ascertain the effect of various walleye fry stocking rates on the sportfish harvest in 668-ha (1,650-a) Boyd Lake, a typical Colorado Eastern Plains reservoir. Stocking rates of 3,000 and 2,000 fry/surface acre were evaluated in the years 1969-1972 and 1975-1977, respectively. Walleye fry were not stocked in 1973 or 1974 so we could gain an index of natural reproduction. Fish population sampling to determine the composition of resident fish population, and random-stratified creel census to determine fisherman exploitation, were conducted each year of the study. Estimated walleye catch increased from a low of 861 in 1969 to a high of 9,913 in 1972, with a subsequent decline in the catch to an average of 4,330 walleyes per year form 1973 to 1977. The estimated fisherman catch of crappie, the principal sportfish in Boyd Lake prior to the introduction of large numbers of walleye fry, declined from a high of 9,960 in 1969 to 213 in 1977. Estimated annual total numbers of fisherman, hours of fishing effort, and total fish caught declined during the study. Walleye catch-per-man-hour (CPMH) for the period 1969-1977 averaged 0.09 and ranged from a low of 0.01 in 1969 to a high of 0.17 in 1972. The mean CPHM for walley caught from boats and from the bank during the study period was 0.12 and 0.02, respectively. Quality in the walleye fishery, as determined by proportional stock density (PSD), delclined as fisherman catch increased tenfold between 1969 and 1972. The PSD of the crappie fishery was high (94%) in 1969 and remained high as the fisherman catch of crappie in Boyd Reservoir declined throughout the study. It is recommended that if walleye are to be managed as the principal sportfish and predator in selected Colorado reservoirs of lakes, fishery management biologist should plant walleye fry according to a 4-year schedule: Year 1--stock at 2,000 fry/surface acre; year 2--stock at 3,000 fry/surface acre; year 3--do not stock; year 4--do not stock; repeat cycle.

80-003022 Sakuramoto, K. and S. Yamada. A STUDY ON THE PLANTING EFFECT OF SALMON--I. A MATHEMATICAL MODEL FOR THE DERIVATION OF THEIR RATE OF RETURN AND ITS APPLICATIONS. *Bull. Jpn. Soc. Sci. Fish.* 46(6):653-661. June 1980. SFA 25(4)
[Lab. Popul. Dynam., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

80-003023 Sakuramoto, K. and S. Yamada. A STUDY ON THE PLANTING EFFECT OF SALMON--II. ON THE EFFECT OF PLANTING AND FEEDING. *Bull. Jpn. Soc. Sci. Fish.* 46(6):663-669. June 1980. SFA 25(4)
[Lab. Popul. Dynam., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

80-003024 White, L. E. EVALUATION OF A NEW PLANTING DEVICE FOR SALMON EGGS. *Prog. Fish-Cult.* 42(3):177-180. July 1980. SFA 25(4)
[Alaska Dep. Fish Game, Fish. Rehabilitation Enhancement Dev. Div., Kodiak 99615]

80-003025 Willis, M. J. OUT-SYSTEM TRANSFERS OF COHO SALMON STOCKS IN COASTAL RIVER SYSTEMS 1960-79. *Oreg. Dep. Fish. Wildl. Inf. Rep. Ser. Fish.* No. 79-9. 12p. Sept. 1979. SFA 25(4)

FISHING GEAR AND TECHNIQUES

80-003026 Brabant, J. C. and C. Nédélec. BOTTOM TRAWLS FOR SMALL-SCALE FISHING. *FAO Fish. Tech. Pap.* No. 189. v + 40p. 1979. SFA 25(4)
[Inst. Sci. Tech. Pech. Mar., 62200 Boulogne-sur-Mer, France]

80-003027 Ishida, T.; M. Tanaka and K. Ohkuma. [ON THE MESH SELECTIVITY OF GILLNET FOR KOKANEE.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 34. p. 121-123. Mar. 1980. In Japanese. SFA 25(4)

80-003028 Joswiak, G. R.; P. J. English; W. S. Moore and A. B. Eisenbrey. INTEGRATED-CIRCUIT PULSE TRIGGER FOR ELECTRIFISHING. *Trans. Am. Fish. Soc.* 109(3):340-342. May 1980. SFA 25(4)
[Dep. Biol. Sci., Wayne State Univ., Detroit, MI 48202]

80-003029 Libey, G. S. and J. R. Beltz. METHOD FOR MONITORING DOWNSTREAM-MIGRATING ALEWIVES. *Prog. Fish-Cult.* 42(3):172-173. July 1980. SFA 25(4)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

80-003030 Matuda, K. and N. Sannomiya. COMPUTER SIMULATION OF FISH BEHAVIOR IN RELATION TO FISHING GEAR--I. MATHEMATICAL MODEL OF FISH BEHAVIOR. *Bull. Jpn. Soc. Sci. Fish.* 46(6):689-697. June 1980. SFA 25(4)
[Tokyo Univ. Fish., Minato-ku, Tokyo 108, Japan] A mathematical model is presented in order to investigate the problems of fish behavior in relation to fishing gear using the technique of computer simulation. The fundamental equations of motion are described by regarding the motion of a fish as that of a particle. The equations of motion contain the fundamental elements of fish behavior such as mass, drag coefficient and external forces acting on the fishes. As external forces, the following six forces are introduced; propulsive force, interactive force, schooling force, repulsive force against wall, directional force and random force. The computer simulation is carried out by solving a system of the nonlinear difference equations by means of TSS (Time Sharing System). The position of each individual is plotted as a result of the computer experiment in order to check the propriety of the model. The moving patterns of fishes obtained by the simulation are quite similar to actual behavior of fish school. It was shown that the model is suitable for investigating fish behavior in relation to fishing gears.

80-003031 Mesick, C. F. and J. C. Tash. EFFECTS OF ELECTRICITY ON SOME BENTHIC STREAM INSECTS. *Trans. Am. Fish. Soc.* 109(4):417-422. July 1980. SFA 25(4)
[Ariz. Coop. Fish. Res. Unit, Univ. Ariz., Tucson 85721]

80-003032 Wohlgemuth, E. ON SELECTIVITY OF GILL NETS FOR, AND CERTAIN BIOLOGICAL PARAMETERS OF, *ALBURNUS ALBURNUS* AND *RUTILUS RUTILUS*. *Folia Zool.* 28(4):371-383. 1979. SFA 25(4)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

80-003033 Haynes, J. M. and R. H. Gray. INFLUENCE OF LITTLE GOOSE DAM ON UPSTREAM MOVEMENTS OF ADULT CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*. *NOAA Fish. Bull.* 78(1):185-190. 1980. SFA 25(4)
[Dep. Biol. Sci., State University Coll., Brockport, NY 14420]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

80-003033 CONTINUED

80-003034 Moen, T. E. and M. R. Dewey. LOSS OF LARVAL FISH BY EPILIMNIAL DISCHARGE FROM DEGRAY LAKE, ARKANSAS. *Proc. Ark. Acad. Sci.* 32:65-67. 1978. SFA 25(4)

[U.S. FWS, Multi-Outlet Reservoir Study, Arkadelphia, AR 71923] Weekly samples of larval fish were collected from water discharged from the epilimnion of DeGray Lake into the tailwaters, for power generation, from April through August, 1976 and 1977. Peak rates of loss measured were 1.4 larvae/m^3 in May, 1976 and 2.7/m^3 in April, 1977. Sunfish, shad and crappie made up 97% of an estimated 83.3 million fish lost in 1976, and 98% of 122.4 million lost in 1977. The most critical period for larval fish loss extended from the last week of April to the first week of June. No definite relationships were noted between length of the power generation period or power generation rate, and rate of larval fish discharge. Diel collections showed the rate of larval fish discharge to be lower and more uniform during darkness than during daylight.

MATHEMATICS, STATISTICAL METHODS, AND MODELING

80-003035 Aalto, S. and G. E. Newsome. SOME METHODS OF ESTIMATING THE PARAMETERS OF THE LESLIE MATRIX USING INCOMPLETE POPULATION DATA. *Can. J. Fish. Aquatic Sci.* 37(7):1140-1148. July 1980. SFA 25(4)

[Dep. Math., St. Francis Xavier Univ., Antigonish, NS B2G 1C0, Canada]

80-003036 DeAnglis, D. L.; P. A. Hackney and J. C. Webb. A PARTIAL DIFFERENTIAL EQUATION MODEL OF CHANGING SIZES AND NUMBERS IN A COHORT OF JUVENILE FISH. *Environ. Biol. Fishes* 59(3):261-266. 29 Sept. 1980. SFA 25(4)

[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830] Numbers and lengths of young crappie were measured over a 20-week period in a Tennessee River reservoir. From these data, the average length at the swimming interval and growth rate were computed. A partial differential equation model was formulated for changes in length distribution through time. The equation was solved analytically and this solution used to predict the numbers by length class through time, given an initial known recruitment or swim-up rate. The simulated numbers agreed in considerable detail with the observations, indicating that the model accurately reflected the basic population mechanics involved. This suggests the model can be used to predict impacts to the fish population of size-dependent mortality caused by man, such as impingement on power plant intake screens.

80-003037 Gardner, R. H.; R. V. O'Neill; S. W. Christensen; W. Van Winkle and J. H. Carney. ERROR ANALYSIS OF DENSITY-INDEPENDENT AND DENSITY-DEPENDENT LESLIE MODELS FOR FISH POPULATIONS. *Bull. Ecol. Soc. Am.* 61(2):62. June 1980. Abstract only. SFA 25(4)

[Oak Ridge Natl. Lab., Oak Ridge, TN] The direct effects and interactions of parameter uncertainties, number of life stages (age classes), density dependent survivorship, and power plant mortality have been considered for several density independent and density dependent Leslie matrix models of fish populations. Monte Carlo methods were used to generate random values for parameters (normal distributions and coefficient of variation, CV, of 10%) and to produce 1000 solutions of each system. Comparisons at year 40 of several density-independent models indicated that all these models amplify errors with time. If P_0, the probability of survivorship from eggs to young-of-the-year, is held constant the mean total population of striped bass (15 age classes) varies by 6%. If P_0 is allowed to vary the predicted

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

80-003037 CONTINUED mean increases by a factor of 2 and the CV increases to 254%. Predictions based solely on the mean or the deterministic solution may be inadequate and misleading. Comparison of several density-dependent models failed to demonstrate the biased predictions of the density-independent models. With the uncertainties set at 10%, it is not possible to distinguish between these models or to demonstrate distinct differences in behavior.

80-003038 Mendelssohn, R. USING MARKOV DECISION MODELS AND RELATED TECHNIQUES FOR PURPOSES OTHER THAN SIMPLE OPTIMIZATION: ANALYZING THE CONSEQUENCES OF POLICY ALTERNATIVES ON THE MANAGEMENT OF SALMON RUNS. *NOAA Fish. Bull.* 78(1):35-50. 1980. SFA 25(4)
[NMFS, Southwest Fish. Cent., Honolulu, HI 96812] The mathematics of Markov decision processes and related techniques are used to analyze a model relevant to salmon management. It is shown that the choice of grid can have a significant effect on the results obtained. Optimal policies that maximize total expected discounted return may be too variable. Smoothing costs are included to trade off long-run total return against the smoothness of the year-to-year fluctuations in the allowed harvest. Simpler, approximate policies that have a smoothing effect are also found. Preliminary analysis suggests the results are robust against misspecification of the parameters of the model. Concepts such as maximum sustainable yield would seem to impute a very high smoothing cost and are probably not practical for fish populations with a significant degree of randomness.

80-003039 Mohn, R. K. BIAS AND ERROR PROPAGATION IN LOGISTIC PRODUCTION MODELS. *Can. J. Fish. Aquatic Sci.* 37(8):1276-1283. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, P.O. Box 550, Halifax, NS B3J 2S7, Canada]

80-003040 Nielsen, L. A. and W. F. Schoch. ERRORS IN ESTIMATING MEAN WEIGHT AND OTHER STATISTICS FROM MEAN LENGTH. *Trans. Am. Fish. Soc.* 109(3):319-322. May 1980. SFA 25(4)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061]

80-003041 Paloheimo, J. E. ESTIMATION OF MORTALITY RATES IN FISH POPULATIONS. *Trans. Am. Fish. Soc.* 109(4):378-386. July 1980. SFA 25(4)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

80-003042 Peterson, J.; M. Taylor and A. Hanson. LESLIE POPULATION ESTIMATE FOR A LARGE LAKE. *Trans. Am. Fish. Soc.* 109(3):329-331. May 1980. SFA 25(4)
[Nebr. Game Parks Comm., Lincoln 68503]

80-003043 Roff, D. A. and D. J. Fairbairn. AN EVALUATION OF GULLAND'S METHOD FOR FITTING THE SCHAEFER MODEL. *Can. J. Fish. Aquatic Sci.* 37(8):1229-1235. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

80-003044 Stauffer, J. R.; R. L. Reish and W. F. Calhoun. FORTRAN PROGRAM FOR CALCULATING BRILLOUIN'S SPECIES DIVERSITY INDEX. *Prog. Fish-Cult.* 42(3):185-187. July. 1980. SFA 25(4)
[Appalachian Environ. Lab., Univ. Md., Frostburg State Coll., Frostburg 21532]

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

80-003045 Uhler, R. S. LEAST SQUARES REGRESSION ESTIMATES OF THE SCHAEFER PRODUCTION MODEL: SOME MONTE CARLO SIMULATION RESULTS. *Can. J. Fish. Aquatic Sci.* 37(8):1284-1294. Aug. 1980. In English with French summ. SFA 25(4)
[Dep. Econ., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

LAKE MANAGEMENT AND RESEARCH

80-003046 Forney, J. L. EVOLUTION OF A MANAGEMENT STRATEGY FOR THE WALLEYE IN ONEIDA LAKE, NEW YORK. *N.Y. Fish Game J.* 27(2):105-141. July 1980. SFA 25(4)
[Dep. Nat. Sci., Cornell Univ., Ithaca, NY] The search for a viable management strategy for the walleye in Oneida Lake began in the 1950's when fluctuations in the catch and other symptoms of stress were first detected. Surveys to estimate the harvest and the abundance of stock established the fact that angling exploitation was intense in some years, but much of the variability in walleye abundance was attributable to 40-fold fluctuations in recruitment. Subsequent research focused on questions of how recruitment was regulated and interactions between the walleye and its primary prey the yellow perch. Managers who expect large gains in yield by fine-tuning sport fisheries will find little encouragement in this paper. Frequent changes in the vulnerability of the walleye to angling reduced the effectiveness of angling regulations, and hopes of increasing recruitment were frustrated by evidence that there were few "surplus" prey to support a larger predator population.

80-003047 Johnson, M. G. GREAT LAKES ENVIRONMENTAL PROTECTION POLICIES FROM A FISHERIES PERSPECTIVE. *Can. J. Fish. Aquatic Sci.* 37(7):1196-1204. July 1980. SFA 25(4)
[Great Lakes Biolimnol. Lab., Burlington, ON, Canada]

RIVER AND STREAM MANAGEMENT AND RESEARCH

80-003048 Balirwa, J. S. and F. W. B. Bugenyi. NOTES ON THE FISHERIES OF THE RIVER NZOIA, KENYA. *Biol. Conserv.* 18(1):53-58. June 1980. SFA 25(4)
[Uganda Freshwater Fish. Res. Organ., P.O. Box 343, Jinja, Uganda] The fisheries of the River Nzoia in Western Kenya depend largely on seasonal flooding regimes which result in the ascent of migrant fishes from Lake Victoria. These notes summarise some of the information available on the fisheries, and discuss recent data on some physico-chemical features of the river, as well as other factors which may possibly endanger the fishery.

80-003049 Bodi, F. L. PROTECTING COLUMBIA RIVER SALMON UNDER THE ENDANGERED SPECIES ACT. *Environ. Law* 10(2):349-387. 1980. SFA 25(4)
[NOAA, Off. Gen. Counc., Seattle, WA]

80-003050 Dudley, R. G. and R. J. Scully. CHANGES IN EXPERIMENTAL GILLNET CATCHES FROM THE KAFUE FLOODPLAIN, ZAMBIA, SINCE CONSTRUCTION OF THE KAFUE GORGE DAM. *J. Fish. Biol.* 16(5):521-537. May 1980. SFA 25(4)
[Sch. For. Resour., Univ. Ga., Athens 30602] The Kafue Floodplain fishery produces an annual fish yield of about 5000 tonnes. The 1971 closure of the Kafue Gorge Dam downstream from the floodplain modified flooding patterns.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

80-003050 CONTINUED Pre-impoundment studies predicted this modification would increase fish stocks. Experimental gillnets set in 1975 and 1976 caught 18 species on a regular basis, nine of which were abundant enough for comparison with catches in similar gillnet samples taken prior to completion of the Kafue Gorge Dam. Of these nine species, experimental gillnet catches of three predator species were smaller in 1975-76 than in 1969-70. Catches of only one species increased significantly. Whether this change is due to the modified flooding pattern is unclear; unusually dry flood conditions in 1973 and increased fishing effort may have contributed.

80-003051 Landau, J. C. EMPTY VICTORIES: INDIAN TREATY FISHING RIGHTS IN THE PACIFIC NORTHWEST. *Environ. Law* 10(2):413-456. 1980. SFA 25(4)
[Northwestern Sch. Law, Lewis and Clark Coll., Portand, OR]

80-003052 McArthur-Phillips, M. ODD MAN OUT: IDAHO'S BID FOR A FAIR SHARE OF COLUMBIA RIVER UPRIVER ANADROMOUS FISH STOCKS. *Environ. Law* 10(2):389-411. 1980. SFA 25(4)
[Northwestern Sch. Law, Lewis and Clark Coll., Portland, OR]

80-003053 McPherson, B. MORE ON THE ROGUE. *Oreg. Wildl.* 35(9):10-11. Sept. 1980. SFA 25(4)
[4100 SE Delmonte Place, Albany, OR 97321]

80-003054 Platts, W. S. and S. B. Martin. RETURN OF THE SOUTH FORK SALMON. *Idaho Wildl.* 2(4):2-9. July-Aug. 1980. SFA 25(4)
[U.S. For. Serv., Intermountain For. Range Exp. Stn., 507 25th St., Ogden, UT 84401] The South Fork Salmon River steadily degraded from 1952 to 1965 from accrued bedload sediment caused mainly by road construction and logging. During 1952 to 1965 the river was incapable of discharging the bedload sediment as fast as it was being recruited. Spawning and rearing areas were blanketed with sand during this period. During 1966 to 1970 the river gained the capability of discharging, from its system, sediment equal to that being accrued from the watershed, plus portions of the sediment contained within the channel. This report discusses these changes as they influenced the spawning and rearing areas.

80-003055 Reice, S. R. THE EFFECTS OF FISH MANIPULATIONS AND DETRITUS LOAD ON WOODLAND STREAM ECOSYSTEMS. *Bull. Ecol. Soc. Am.* 61(2):98. June 1980. Abstract only. SFA 25(4)
[Univ. N.C., Chapel Hill] The experiment addresses the question of the relative roles of predation and competition in determining community structure and function in small woodland streams. Two second order streams in Piedmont North Carolina were divided into 12 experimental segments with wiers. Each experimental segment was approximately 3 m wide and 10 m long. Half the segments had all fish removed by electroshocking, while the others were unchanged. The fish treatment was cross-classified with a detritus manipulation. Detritus in the form of leaves was added or removed to produce 4 times normal, normal, and 5% normal detritus levels. Each treatment combination was replicated twice. The system-wide reponse over 2 years was monitored by sampling. Reponse varibles for the animal community which were measured included: species distribution and abundance, species richness and diversity, biomass of major taxonomic groups, and other structural features. The system's functional response was measured as change in the monthly leaf litter decompositon rate. Implications for the regulation of community structure in ecosystems are suggested.

80-003056 Robinson, J. L. and M. A. Smith. STREAM MORPHOLOGY IN TWO ADJACENT GRAZING SYSTEMS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:28-31. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St.,

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

80-003056 CONTINUED Rock Springs, WY 82901] SFA 25(4)
This report presents the results of studies conducted on Pole Moutain, in the Medicine Bow National Forest, East of Laramie, Wyoming. This study evaluated stream morphology in continuous and deferred rotation grazing allotments. Results indicate an increase in bank stability following implementation of deferred rotation grazing. Improvements in stream morphology also included greater stream channel with water ratio and different overhead cover. Fish population surveys provided by the Wyoming Game and Fish Department indicate population increases in brook trout (*Salvelinus fontinalis*) in the deferred rotation streams.

80-003057 Smith, B. H. NOT ALL BEAVER ARE BAD; OR, AN ECOSYSTEM APPROACH TO STREAM HABITAT MANAGEMENT, WITH POSSIBLE SOFTWARE APPLICATIONS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:32-37. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[1605 Donalynn Dr., #26, Rock Springs, WY 82901] Pilot studies in the Rock Springs District have indicated that the establishment of stream habitat improvements can be achieved through a "software" approach of providing evironmental limiting factors for beaver, i.e., necessary material and food supplies. When applied within a multiple-use management framework, this approach could prove to be highly compatible with other programs (e.g., aspen thinning to stimulate big game browse regeneration). In addition, when compared to physical instream improvements, the approach could be quite cost effective in ligh of present material, installation, and maintanence costs.

80-003058 Wilson, J. RESEARCH PROJECT PROVIDES A SHOCKING LOOK AT MUSKY STREAMS. *Ky. Happy Hunting Ground* 36(4):10-15. July-Aug. 1980. SFA 25(4)

80-003059 Windell, J. T. COLORADO'S WATER RESOURCES, USES, ABUSES AND CURRENT STATUS. *Proc. Annu. Meet. Colo.-Wyo. Chapter Am. Fish. Soc.* 15:47-57. 1980. Available @ $5.00 from Bruce Smith, 2403 Victor St., Rock Springs, WY 82901. SFA 25(4)
[Dep. EPO Biol., Univ. Colo., Boulder 80309] A holistic view of Colorado's water resources, uses, abuses, and current status is examined by using the Horton-Strahler stream order analysis system. It is proposed that the management of state water resources should be related to the integrated whole which has a reality independent of and greater than the sum of the parts. Analysis of a computer generated resource map indicates that 56% and 44% of the total land surface in Colorado contains approximately 16,700 miles of coldwater and warmwater resource, respectively. Small streams (orders 1-3) comprise 85%, medium streams (orders 4-6) 12%, and large streams (orders 7-12) 3% of the total stream mileage. Documented evidence, from specific uses and abuses such as road building, water supplies, point source and nonpoint source pollution, mine drainage, dam and reservoir construction, transmountain diversions, channelization-dredge and fill operations, irrigated agriculture, instream flows, livestock grazing, fish and wildlife, and small habitat modifications, suggest that the majority of man's activities are concentrated on an extremely limited and finite number of medium (1,044 miles) and large (261 miles) coldwater stream miles.

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

80-003060 Carline, R. F. FEATURES OF SUCCESSFUL SPAWNING SITE DEVELOPMENT FOR BROOK TROUT IN WISCONSIN PONDS. *Trans. Am. Fish. Soc.* 109(4):453-457. July 1980. SFA 25(4)

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

80-003060 CONTINUED
[Ohio Coop. Fish. Res. Unit, Ohio State Univ., 1735 Neil Ave., Columbus 43210]

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

80-003061 Dudley, R. G.; R. D. Quintrell and G. S. Beisser. HYPOLIMNIAL OXYGEN INJECTION: A BENEFIT TO DOWNSTREAM FISH POPULATIONS? *Environ. Biol. Fishes* 5(3):235-242. 29 Sept. 1980. SFA 25(4)

[Sch. For. Resour., Univ. Ga., Athens 30602] Changes in electrofishing catch rates downstream from Clark Hill Reservoir were only mildly affected by addition of oxygen to the hypolimnion waters prior to discharge in spite of increases in oxygen concentration. Changes in abundance and distribution of six major species were detectable and beneficial effects undoubtedly occur, but the overall benefit of oxygenation, at least at Clark Hill Dam, is questionable. At other dams with a more pronounced and prolonged oxygen-poor period, oxygenation may be worthwhile.

80-003062 Kohler, C. C. TROPHIC ECOLOGY OF AN INTRODUCED, LAND-LOCKED ALEWIFE (*ALOSA PSEUDOHARENGUS*) POPULATION AND ASSESSMENT OF ALEWIFE IMPACT ON RESIDENT SPORTFISH AND CRUSTACEAN ZOOPLANKTON COMMUNITIES IN CLAYTOR LAKE, VIRGINIA. *Ph.D. dissertation, VPI&SU.* 208p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(3):806. Sept. 1980. SFA 25(4)

Although alewife were shown to possess several negative traits for forage fish, no forage species has proven ideal for southeastern reservoirs. Alewife introduction should be limited to systems too cold for threadfin shad, and that are managed primarily for pelagic predators with non-pelagic young or those that are maintained on a put-grow-take basis. Results of the study underscore the importance of assessing community impacts of all exotic species before wide-spread introduction.--From abstr.

MARINE MANAGEMENT AND RESEARCH

80-003063 Clark, C. W. TOWARDS A PREDICTIVE MODEL FOR THE ECONOMIC REGULATION OF COMMERCIAL FISHERIES. *Can. J. Fish. Aquatic Sci.* 37(7):1111-1129. July 1980. SFA 25(4)
[Dep. Math., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

80-003064 FAO of the UN. ASSESSMENT AND MANAGEMENT OF THE BLACK SEA TURBOT. *FAO Fish Rep.* No. 226. v + 19p. 1979. SFA 25(4)
[Rome, Italy]

80-003065 FAO of the UN. WORKING PARTY OF EXPERTS ON CENTRAL AND WESTERN PACIFIC SKIPJACK. *FAO Fish Rep.* No. 224. iv + 8p. 1979. SFA 25(4)
[Rome, Italy]

80-003066 FAO of the UN. INDIAN OCEAN FISHERY COMMISSION. COMMITTEE FOR THE DEVELOPMENT AND MANAGHEMENT OF THE FISHERY RESOURCES OF THE GULFS. *FAO Fish. Rep.* No. 223. v + 15p. 1979. SFA 25(4)
[Rome, Italy]

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

80-003067 Reshetnikov, Yu. S. WHITEFISHES IN NORTHERN ECOSYSTEMS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 19(3):31-44. 1979. SFA 25(4)
[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad. Sci., Moscow, USSR] Whitefishes constitute 70-80% of the fish production in Arctic and subarctic freshwater ecosystems. A considerable part of the energy feeding into such ecosystems is used to maintain the biomass of large fish of an older age, i.e. the biomass predominates considerably over production, and the P/B coefficient is 13-30%, while fish productivity rarely exceeds 2-5 kg/ha. The influence of fishing, eutrophication and the introduction of new species on the compositon and structure of the fish fauna is analyzed, taking Lake Imandra, Syamozero, the Pskov-Chudskoye body of water and Lake Sevan as examples. Successional changes in ecosystems as they become enriched, take the form of replacing whitefishes by Percidae and Cyprinidae, while the species diversity and yield increase with the increase in feeding capacity. Starting from the place and role of whitefishes in northern ecosystems and from the three main forms of commercial utilization of these fish (fishing, acclimatization and hatchery rearing) an overall assessment is given of the potentialities of whitefishes in ecosystems of different types, and promising methods of conducting a whitefish farm are outlined.

80-003068 Thurow, F. THE STATE OF FISH STOCKS IN THE BALTIC. *Ambio* 9(3/4):153-157. 1980. SFA 25(4)
[Kiel Univ., Wischhofstr. 1-3, D-2300 Kiel 14, West Germany]

MISC. TECHNIQUES AND EQUIPMENT

80-003069 Foote, K. G. ANGULAR MEASURES OF DORSAL ASPECT TARGET STRENGTH FUNCTIONS OF FISH. *Fiskeridir. Skr. Ser. Havunders.* 17(2):49-70. 1980. SFA 25(4)
[Dep. Appl. Math., Univ. Bergen, Norway]

80-003070 Pieper, R. E. and B. G. Bargo. ACOUSTIC MEASUREMENTS OF A MIGRATING LAYER OF THE MEXICAN LAMPFISH, *TRIPHOTURUS MEXICANUS*, AT 102 KILOHERTZ. *NOAA Fish. Bull.* 77(4):935-942. 1980. SFA 25(4)
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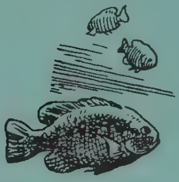

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   80-000649
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    - 80-001439
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    - 80-000125
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    - 80-001593
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    - 80-001716
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    Stre
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    - 80-001344
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    - 80-000057
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    - 80-002344
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    - 80-002154
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  Arkansas: Caddo River
    80-002849
  Arkansas: Izard Cty.: Piney Cree
    80-002860
  Arkansas: Moro Creek
    80-002862
  Arkansas: Ouachita River
    80-002852
  Arkansas: Ten Mile Creek
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80-001390
80-002205
Atlantic Ocean, North: Canary Current
80-000483
Atlantic Ocean, North: South Atlantic Bight
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80-002231
Atlantic Ocean: New York
80-002210
Australia: Queensland: Serpentina Creek
80-002148
Australia: Queensland: Trinity Bay
80-002845
Brazil
80-000486
California
80-001404
California: Monterey Bay
80-000471
California: Pacific Current
80-001389
Canada: Hudson Bay
80-002220
Canada: James Bay
80-002220
Caribbean Sea
80-002200
Catostomidae
80-001449
Cebidichthyidae
80-002257
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80-001366
Colorado: White River
80-001371
Colorado: Yampa River
80-001371
Delaware
80-001402
Florida: Hillsborough Bay
80-001418
Florida: Okaloosa Cty.
80-001387
Florida: Tampa Bay
80-001374
French Polynesia
80-001378
Georgia: Carroll Cty.: Dog River
80-002218
Guatemala
80-002863
Gulf of Aqaba
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Halosauridae
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Idaho: Palouse River
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Idaho: Silver Creek
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Iran
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Kansas: Doniphan Cty.: Wolf River
80-001373
Kentucky
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80-001416
Louisiana: Caminada Bay
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Massachusetts: Beverly-Salem Harbo
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Massachusetts: Pleasant Bay
80-001376
Mexico: Rio Yaqui
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Mississippi: Horn Island
80-000490
Montana, Southeastern
80-002203
Nebraska: Salt Creek
80-002857
Nebraska: Thirty-two Mile Creek
80-002866
New Jersey: Newark Bay
80-001423
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  Ohio: Chagrin River
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  Panama: Caribbean Sea
   80-002200
  Pennsylvania: Yellow Breeches Creek
   80-002232
  Pennsylvania: Youghiogheny River
   80-000482
  Pholidae
   80-002257
  Red Sea
   80-000481
   80-002244
  Rhabdosargus
   80-000524
  Saudi Arabia
   80-002194
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  Sea of Japan
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  South Carolina: North Inlet
   80-002143
  South Carolina: South Atlantic Bight
   80-001429
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   80-002257
  Texas: Chenier Plain Coastal Area
   80-001379
   80-001380
   80-001381
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   80-002244
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   80-002205
  Univ. Bergen, Norway, Mus. Zool.
   80-000479
  USSR: Pacific Ocean
   80-002853
  Utah: San Rafael River
   80-001403
  Virginia: James River
   80-001399
  Virginia: New River
   80-001419
  Washington
   80-001434
  Washington: Palouse River
   80-001401
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   80-000472
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   80-000753
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Parasites/Diseases
  Haemogregarina aeglefini
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  Haemogregarina sachai
   80-001524
   80-002275
  Haemogregarina simondi
   80-000552
   80-000553
  Haemohormidium cotti
   80-002301
   80-002302
  Haplocleidus dispar
   80-002291
  Harveytrema bisulcatum
   80-001575
  Helminths
   80-001556
   80-001590
   80-002300
  Hematozoa
   80-000549
   80-000551
   80-001513
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   80-001519
   80-001524
   80-002275
   80-002283
  Henneguya
   80-002282
  Henneguya psorospermica
   80-001512
  Hepatomas
   80-001606
   80-001609
   80-002314
  Herpesvirus scophthalmi
   80-001533
   80-001545
  Hexamita salmonis
   80-001521
  Hyperostosis
   80-001585
  Hyperplasia
   80-002365
  Ichthyophonus
   80-001506
  Ichthyophthirius multifiliis
   80-002274
  Ichtyobodo necator
   80-001520
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  IHN
   80-001535
   80-001542
  Immune Hypersensitivity
   80-001571
  Immune Response
   80-000248
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   80-001474
   80-001478
   80-001482

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Parasites/Diseases
  Immune Response
    80-001496
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  Immunization
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    80-002903
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  Injuries
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  Isoparorchis hypselobagri
    80-001580
  Lepeophtheirus salmonis
    80-000562
  Leptorhynchoides thecatus
    80-001572
  Lernaeenicus sprattae
    80-001598
  Lipophoromatosis
    80-001555
  Lironeca ovalis
    80-001589
  Lymphocystis
    80-000557
    80-001531
    80-001548
  Lymphosarcomas
    80-001593
  Margaritifera margaritifera
    80-002310
  Meinertia
    80-000574
  Meningitis
    80-001505
  Microsporida
    80-001518
    80-002296
  Monostephanostomum manteri
    80-001576
  Mycobacterium
    80-001492
    80-002268
  Mycobacterium fortuitum
    80-002904
  Myxobilatus
    80-002912
  Myxobolus
    80-002916

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Parasites/Diseases
  Myxobolus exiguus
    80-002280
    80-002281
  Myxobolus insidiosus
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  Myxosoma cerebralis
    80-002276
  Myxosoma funduli
    80-001517
  Myxosoma microspora
    80-002313
  Myxosporida
    80-000550
    80-002278
    80-002280
    80-002281
  Neascus cuticola
    80-001596
  Nematobothrium spinneri
    80-001577
  Nematodes
    80-000558
    80-000560
    80-001566
    80-001601
    80-001602
    80-002316
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    80-002923
    80-002928
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    80-002935
    80-002936
    80-002939
  Neocamallanus bareilliensis
    80-002316
  Neoechinorhynchus rutili
    80-001608
  Neometadidymozoon helicis
    80-001577
  Nephrocalcinosis
    80-001569
    80-001603
  Nutritional Diseases
    80-001595
    80-001605
    80-002284
  One-Eye Disease
    80-001574
  Ornithodiplostomum ptychocheil
    80-000568
    80-000575
  Oxytetracycline
    80-000533
  Pansteatitis
    80-001595
  Parasitic Copepods
    80-000561
    80-000569
    80-000572
    80-001560
    80-001598

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Parasites/Diseases
  Parasitic Isopods
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  Parasitic Molluscs
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  Parasiticides
   80-001666
  Philometra
   80-002300
   80-002923
  Phocanema decipiens
   80-001566
  Phocascaris
   80-001601
   80-001602
  Piromidic Acid
   80-001475
   80-001497
  Piscine Erythrocytic Necrosis
   80-000532
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  Pituitary Cysts
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   80-000147
  Pleistophora typicalis
   80-002913
  Polyonchobothrium clarias
   80-002318
  Polypodium hydriforme
   80-001591
  Proliferative Kidney Disease
   80-001563
   80-002279
  Proteus rettgeri
   80-001485
  Protozoan Diseases
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  Pseudomonas anguilliseptica
   80-000538
   80-000542
  Pseudomonas fluorescens
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  Pterocleidus acer
   80-002291
  Red-Sore Disease
   80-001494
  Red-Spot Disease
   80-000538
   80-000542
  Renibacterium salmoninarum
   80-002272
  Rhabdochona parastromatei
   80-000560
  Rogersus rogersi
   80-002938
  Saddleback Disease
   80-002905
  Salmon Lice
   80-000562
  Saprolegnia
   80-000546
   80-001510
  SBS
   80-001500
  Serpentisaccus magnificae
   80-000561
  Sphaerospora angulata
   80-001511
  Spring Viremia
   80-001530
  Streptococcus
   80-000535
   80-001484
   80-001498
  Systemic Granulomata
   80-002288
  Telogaster opisthorchis
   80-001581
  Tetracycline Hydrochloride
   80-001699

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Parasites/Diseases
  Transversotrema patialense
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  Trematodes
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   80-002933
  Triganodistomum attenuatum
   80-002311
  Truttaedacnites truttae
   80-002935
  Trypanoplasma beckeri
   80-000547
  Trypanoplasma borelli
   80-001519
  Trypanoplasma salmositica
   80-002283
  Trypanorhyncha
   80-001557
  Trypanosoma danilewskyi
   80-001519
  Trypanosomes
   80-000551
   80-001519
  Tuberculosis
   80-002264
   80-002268

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Parasites/Diseases
  Tumors
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   80-001587
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   80-001593
   80-002289
   80-002309
   80-002904
  Ulcerative Dermal Necrosis
   80-001501
   80-001554
   80-002265
   80-002266
   80-002273
  Ulcers
   80-000539
  Urocleidus angularis
   80-000559
  Urocleidus ferox
   80-001584
  Uronema marinum
   80-002914
  Vertebral Dysplasia
   80-001660
  Vibrio
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   80-001495
  Vibrio anguillarum
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   80-001489
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   80-001503
   80-002263
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   80-002907
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  Vibriosis
   80-000536
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  Viral Diseases
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   80-001532

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- Parasites/Diseases
  - Viral Diseases
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    - 80-002919
    - 80-002920
    - 80-002921
  - Viral Erythrocytic Necrosis
    - 80-000555
    - 80-002286
  - Viral Hemorrhagic Septicemia
    - 80-001532
    - 80-001536
  - Whirling Disease
    - 80-002276
  - Yersinia ruckeri
    - 80-001482
    - 80-001487
- Physiology
  - Acoustico-Lateralis System
    - 80-000286
    - 80-002603
  - Adrenaline
    - 80-000128
    - 80-000282
  - Air Breathing
    - 80-000136
    - 80-000163
  - Amino Acids
    - 80-000179
    - 80-000180
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  - Ammonia
    - 80-000240

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- Physiology
  - Ampullae of Lorenzini
    - 80-000938
  - Ampullary System
    - 80-001940
  - Angiotensin
    - 80-002641
  - Anoxia
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  - Antifreeze Production
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    - 80-002019
  - Antigens
    - 80-001581
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  - Bioluminescence
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Physiology
  Blood Chemistry
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  Calcium
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  Calorific Values
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  Carbon
    80-002490

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Physiology
  Carbon Dioxide
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  Cardio-Vascular System
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  Catecholamines
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  Caudal Neurosecretory System
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  Chemoreception
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  Chloride Cells
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    80-000948
  Chromaffin Tissue
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  Circulatory System
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  Corpuscle of Stannius
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  Corticosteroids
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    80-002679

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Physiology
Cortisol
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Decomposition
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Digestion Rates
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Digestive System
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Digestive System/Bacterial Flora
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DNA
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Eggs
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Electric Organs
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Electrophoresis
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Electrophysiology
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Electroreception
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Endocrinology
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Hormones
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Immune Response
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Immunoglobulins
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Incubation
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Induced Maturation
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Integument
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80-001936
Iron
80-000937
Isoproterenol
80-000226
Lactate Dehydrogenase
80-002609
Lactate Levels
80-000989
LAN
80-000951
Lipid Composition
80-000171
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Lipid Content
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Lipid Metabolism
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Liver
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M-ENK
80-001067

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Physiology
  Malate Dehydrogenase
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  Melatonin
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  Mercury
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  Metabolic Rates
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    80-002676
  Metabolism
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LIST OF PUBLICATIONS SCREENED

The following publications were screened for Volume 25. Publications not included on this list are irregularly published papers or separates from publications not regularly received by the Morgan Library of Colorado State University or this editorial office.

Acta Agriculturae Scandinavica
Acta Biotheoretica
Acta Hydrochimica et Hydrobiologica
Acta Parasitologica Polonica
Acta Pathologica et Microbiologica Scandinavica Section A Pathology
Acta Pathologica et Microbiologica Scandinavica Section B Microbiology
Acta Pharmacologica et Toxicologica
Acta Physiologica Scandinavica
Acta Protozoologica
Acta Virologica
Acta Zoologica (Sweden)
Acta Zoologica Fennica
Advances in Anatomy, Embryology and Cell Biology
Alabama Conservation
Alaska Department of Fish and Game Informational Leaflet
Alaska Department of Fish and Game Technical Data Reports
Alaska Fish Tales & Game Trails
Ambio
American Journal of Anatomy
American Journal of Physiology
American Journal of Science
American Midland Naturalist
American Museum Novitates
American Naturalist
American Scientist
American Zoologist
Animal Behavior
Animal Learning and Behavior
Animal Regulation Studies
Annales de Biologie Animale Biochemie Biophysique
Annales de Genetique et al Selection Animale
Annales d'hydrobiologie
Annales L'Institut Oceanographique
Annales de Limnologie
Annales des Sciences Naturelles Zoologie et Biologie Animale
Annales of the South African Museum
Annales de Zoologie Ecologie Animale
Annales de Zootechnie
Annals of Applied Biology
Annals of the Cape Provincial Museums Natural History
Annals of Tropical Medicine and Parasitology
Annotationes Zoologicae Japonenses
Annual Proceedings of the Texas Chapter of the American Fisheries Society
Applied Animal Ethology
Applied and Environmental Microbiology
Aquaculture
Archiv fur Fischereiwissenschaft
Archiv fur Hydrobiologie
Archiv fur Hydrobiologie Supplementband
Archiv fur Tierernaehrung
Archives de Biologie
Archives of Environmental Contamination and Toxicology
Archives of Toxicology
Archives de Zoologie Experimentale et Generale
Arctic
Arctic and Alpine Research
Arkansas Game and Fish
Astarte

Australian Journal of Biological Science
Australian Journal of Marine and Freshwater Research
Australian Journal of Zoology
Australian Zoologist
Bamidgeh
Bangladesh Journal of Scientific and Industrial Research
Behavioral Biology
Behavioral Ecology and Sociobiology
Behavioral and Neural Biology
Behaviour
Bijdragen tot de Dierkunde
Biochemical Genetics
Biochemical and Systematic Ecology
Biochimica et Biophysica Acta
Biologia
Biological Bulletin
Biological Conservation
Biological Journal of the Linnean Society
Biological Reviews of the Cambridge Philosophical Society
Biologisches Zentralblatt
Biologist
Biology of Reproduction
Biometrics
Bios
Bioscience
Biosystems
Biotechnology and Bioengineering
Biotropica
Brimleyana
Bulletin of the Alabama Museum of Natural History
Bulletin of the American Museum of Natural History
Bulletin of the British Museum (Natural History) Zoology
Bulletin of the Ecological Society of America
Bulletin of Environmental Contamination and Toxicology
Bulletin of Experimental Biology and Medicine
Bulletin of the Faculty of Fisheries Hokkaido University
Bulletin of the Fisheries Research Board of Canada
Bulletin of the Japanese Society of Scientific Fisheries
Bulletin of Marine Science
Bulletin of Mathematical Biology
Bulletin of the Museum of Comparative Zoology
Bulletin of the Shrimp Culture Research Center (Jepara)
Bulletin de lo Societe Zoologique de France
Bulletin of the South Carolina Academy of Science
Bulletin of the Southern California Academy of Science
California Academy of Science Occasional Papers .
California Cooperative Oceanic Fisheries Investigations Reports
California Department of Fish and Game Fish Bulletins
California Fish and Game
Cal-Neva Wildlife Transactions
Canadian Field-Naturalist
Canadian Journal of Behavioral Science
Canadian Journal of Zoology
Cell and Tissue Research
Ciencia e Pratica
Ciencias Marinas
Clinical Toxicology
Coastal Zone Management Journal
Colorado Outdoors
Commercial Fish Farmer
Comparative Biochemistry and Physiology A Comparative Physiology
Comparative Biochemistry and Physiology B Comparative Biochemistry
Comparative Biochemistry and Physiology C Comparative Pharmacology
Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences Naturelles
Comptes Rendus des Seances de la Societe de Biologie et de ses Filiales
Conservationist
Contributions in Marine Science
Copeia
Critical Reviews in Environmental Control

Critical Reviews in Toxicology
Cryobiology
Deep-Sea Research
Delaware Conservation
Developmental Biology
Dissertation Abstracts International B Science and Engineering
Doklady Biological Sciences
Dynamics of Atmospheres and Oceans
Ecological Law Quarterly
Ecological Modelling
Ecological Monographs
Ecology
Ekologia Polska
Endocrinology
Environmental Affairs
Environmental Conservation
Environmental Law
Environmental Management
Environmental Planning
Environmental Pollution
Environmental Research
Environmental Science and Technology
Estuaries
Evolution
Experientia
Experimental Parasitology
FAO Fisheries Reports
FAO Fisheries Technical Paper
Fieldiana Zoology
Fish Disease Leaflets
Fish Distribution Report
Fish Farming International
Fisheries
Fisheries and Environment Canada Fisheries and Marine Service Technical Reports
Fishery Bulletin
Fisheries Research Board of Canada Miscellaneous Special Publications
Fisheries Research Technical Report of the Ministry of Agriculture, Fisheries and Food
Fisken og Havet
Fiskeridirektoratets Skrifter Serie Havundersokelser
Florida Scientist
Florida Wildlife
Freshwater Biology
General and Comparative Endocrinology
Genetics
Georgia Journal of Science
Great Basin Naturalist
Great Lakes Fishery Commission Technical Reports
Heredity
Hydrobiologia
Hydrobiological Bulletin
Illinois Natural History Survey Bulletin
Indian Journal of Animal Science
Indian Journal of Environmental Health
International Journal of Parasitology
International Journal of Radiation Biology
International Pacific Halibut Commission Scientific Report
International Pacific Halibut Commission Technical Report
Investigations in Fish Control
Iowa Conservationist
Iowa State Journal of Research
Israel Journal of Zoology
Japanese Journal of Applied Entomology and Zoology
Japanese Journal of Ecology
Japanese Journal of Genetics
Japanese Journal of Limnology
Journal of the Acoustical Society of America
Journal of the Alabama Academy of Sciences
Journal of Anatomy
Journal of Animal Ecology
Journal of Animal Morphology and Physiology

Journal of Animal Physiology and Animal Nutrition
Journal of Applied Ecology
Journal of the Arizona Academy of Science
Journal of Biogeography
Journal of the Bombay Natural History Society
Journal of the Colorado-Wyoming Academy of Sciences
Journal of Comparative Ethology
Journal of Comparative Physiology A Sensory, Neural, and Behavioral Physiology
Journal of Comparative Physiology B Metabolic Transport Functions
Journal of Ecology
Journal of the Elisha Mitchell Scientific Society
Journal of Embryology and Experimental Morphology
Journal of Endocrinology
Journal of Environmental Economics and Management
Journal of Environmental Management
Journal of Environmental Pathology and Toxicology
Journal of Environmental Quality
Journal of Environmental Science
Journal of Environmental Science and Health A Environmental Science and Engineering
Journal of Environmental Science and Health B Pesticides, Food Contamination and Agricultural Wastes
Journal of Environmental Systems
Journal of Experimental Biology
Journal of Experimental Marine Biology and Ecology
Journal of Experimental Zoology
Journal of the Faculty of Fisheries and Animal Husbandry Hiroshima University
Journal of the Faculty of Marine Science and Technology Tokai University
Journal of Fish Biology
Journal of the Fisheries Research Board of Canada
Journal of General Physiology
Journal of General Virology
Journal of Great Lakes Research
Journal of Helminthology
Journal of Hydrology
Journal of Ichthyology
Journal of the Idaho Academy of Science
Journal of the Inland Fisheries Society of India
Journal of the Marine Biological Association of the United Kingdom
Journal of Marine Research
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Libyan Journal of Science

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Marine Biology
Marine Fisheries Review
Marine Pollution Bulletin
Maryland Conservationist
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Masters Abstracts
Mauri Ora
Meddelelser fra Danmarles Fiskeri-og Havundirsogelser
Michigan Department of Natural Resources Fishery Research Report
Michigan Natural Resources
Micronesica
Minnesota Volunteer
Minnesota Department of Natural Resources Section of Fisheries Investigational Reports
Mississippi Game and Fish
Missouri Conservationist
Montana Outdoors
Moscow University Biological Science Bulletin
National Parks and Conservation Magazine
Natural History
Naturaliste Canadien
Nature
Nature Canada
Nebraskaland
Nematologica
Netherlands Journal of Zoology
New Hampshire Fish and Game Department Survey Report
New Hampshire Natural Resources
New Jersey Outdoors
New Mexico Academy of Science Bulletin
New Mexico Wildlife
New York Fish and Game Journal
New Zealand Journal of Marine and Freshwater Research
New Zealand Journal of Science
New Zealand Journal of Zoology
New Zealand Ministry of Agriculture and Fisheries Fisheries Research Bulletin
New Zealand Ministry of Agriculture and Fisheries Fisheries Technical Report
NOAA Technical Report NMFS Circular
NOAA Technical Report NMFS SSRF
Norsk Institutt for Vannforskning
North Dakota Outdoors
Northeast Gulf Science
Northwest Science
Occasional Papers of the Museum of Texas Tech University
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Oceanology
Oceans
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Ohio Fish and Wildlife Report
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Oikos
Ontario Fish and Wildlife Review
Oregon Wildlife
Outdoor Arizona
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Outdoor Oklahoma
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Pacific Search
Parasitology
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Piscator
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Proceedings of the Indiana Academy of Science
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Systematic Zoology
Tennessee Wildlife
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Texas Parks and Wildlife

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Toxicon
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Transactions of the Illinois State Academy of Science
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Transactions of the Missouri Academy of Science
Transactions of the Nebraska Academy of Science
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Virginia Journal of Science
Virginia Wildlife
Washington Wildlife
Wassmann Journal of Biology
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Water Research
Water Resources Bulletin
Water Resources Research
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Wisconsin Department of Natural Resources Fish Management Report
Wisconsin Department of Natural Resources Research Report
Wisconsin Department of Natural Resources Technical Bulletin
Wisconsin Natural Resources
Wonderful West Virginia
Wyoming Wildlife
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Zeitschrift fuer Parasitenkunde
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Zoologica Scripta
Zoologica Journal of the Linnean Society
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March 3, 1849

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